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Tests of the Baldwin Compound on the Baltimore & Ohio.

The Baldwin Locomotive Works has just issued a pamphlet containing the results of the extended series of experiments made by Mr. George H. Barrus, of Boston, in April, May and June, of this year, of the four-cylinder compound and a simple locomotive on the Baltimore & Ohio road. We give below the more important portions of the report, which is a long one.

The two locomotives were built for the Baltimore & Ohio, and are in regular service on that road. They are both comparatively new. The compound engine is numbered 848, and the standard engine 849. Both are standard passenger engines, and are duplicates in every respect, except as to cylinders. They are eight-wheel type, and have 33-in. driving-wheels. The compound has 71,515 lbs. on the drivers, and 33,965 lbs. on trucks; the standard engine has 72,400 lbs. on drivers and 33,000 lbs. on trucks. The engines have 53-in. wag-on-boilers extending back through the cab, and the ordinary link motion, with reversing lever. They have extended smoke boxes fitted with screens, straight stacks and plain exhaust nozzles, one for each side of the engine. The fire box is fitted at the front end with a fire-brick arch. The valves of the standard engine are ordinary D-valves, and are balanced by the introduction of packing strips along the four edges of the upper surface. The compound has four cylinders arranged in two independent sets, one on each side of the engine. On each side is one high-pressure cylinder and one low-pressure. The high-pressure cylinder is placed vertically above the low-pressure cylinder, and the two piston rods are attached to a cross-head common to both. One rod takes hold above the guides and the other at the same distance below the guides, and the guides are on a line with the centres of the driving-wheels. A full description of this locomotive was given in the *Railroad Gazette* of May 2 last.

The tests were made on passenger trains in regular service. They were in two series, the first extending from April 30 to May 9, and the second from May 27 to June 2. The first was for a comparison of the two engines, and each engine ran four round trips between Philadelphia and Washington, the compound from April 30 to May 3, and the standard from May 6 to May 9. The train was the Washington Limited Express. The second series was confined to the compound, and consisted of three runs from Philadelphia to Baltimore, on an accommodation train. The return trip was made on an express train. All trips were in the day time.

The data determined on the tests consisted of the weight of coal used for the entire trip; the weight of water used for the entire trip, as also for various periods of the trip; indicator diagrams from each end of each cylinder, and other information of an incidental nature.

The route covered by the first series is 133 miles long and covers two divisions, Philadelphia to Canton, and Canton to Washington. Leaving out the time consumed at Canton, and that lost in crossing the bridge, which may be roughly taken at a total of 15 minutes, the running time on the Washington Limited Express for normal work, between the two terminal stations each way, is about 2½ hours. In order to cover 133 miles in this time the speed of the train must be, in round numbers, 48 miles per hour, making no allowance for stops.

As a rule, the throttle valve was not shut for ordinary down grades or sharp curves, though it was often partly closed when the down grades were very steep. On the Philadelphia division, the steepest grade is 76 ft. on the down trip, per mile, and on the return trip 55 ft. The next steepest grade each way is 42 ft. per mile, and grades of this inclination are quite common. The sharp curve on the Philadelphia division reaches 11 deg., 30 min. (499 ft. rad.). The next sharpest curve is 7 deg. (819 ft. rad.). No profile is at hand of the Washington division, but it is fairly level. The sharpest curve is 10 deg., 30 min. (546 ft. rad.).

The route covered by the second series of tests was the same as the first between Philadelphia and Canton. Beyond Canton the route lay through the suburbs of Baltimore for three miles, to Camden station.

The number of stops is 65. The shortest distance between two consecutive stations is 0.3 of a mile, and the longest 3½. Leaving out the time lost by transfer on the boat at Canton, and that lost at the Susquehanna bridge, which may be taken at 15 min., the total time consumed on this train in normal running is 2 hrs. 35 min. The rate of speed required to cover 96 miles in this time is 41.2 miles per hour, not allowing for stops except as indicated. The schedule time between Canton and Philadelphia is 2 hrs. 10 min. Thus the average rate required is 43 miles per hour.

The train on the first series was composed of four cars

from Philadelphia to Canton and return, and three cars from Canton to Washington and return. On the tests of May 6 and 7 an ordinary combination car and passenger coach were used in place of the vestibule cars employed on the other tests.

The accommodation train consisted of three cars. The express train on the return trip (second series) was composed of five cars.

The coal used on all the tests was George's Creek, Cumberland, bituminous. In order that uniformity might be secured in the quality of the coal for the whole of each series of tests a sufficient quantity was laid by at the beginning to furnish the supply throughout the whole series.

The quantity of water used was determined by measuring from time to time the depth of water in the tank, and taking account of that added at each filling. Two graduated water glasses were attached to the tank, one on each side, the location of each being at the centre of gravity of the area which forms the horizontal cross-section of the tank. Readings of both gauges were taken and averaged. To prevent loss of water from the injector overflow, a device was provided for the reception of the water, which discharged back by gravity into the suction pipe of the injector. This overcame all waste. The tank of each engine was calibrated, and it was found that one barrel of water occupied practically the same depth, whether at one point of the scale or at another, and the average weight for an inch depth was 820 lbs. This quantity is the one taken for each engine. The actual quantity, as tested, was a trifle less than this for one engine and a trifle more for the other.

The indicator apparatus for the first series of tests was arranged so as to apply one indicator to each cylinder. The indicator pipes (¾ in.) were attached to the two cylinder heads, and carried over by easy bends to a central point above the cylinder, where they were attached to a three-way cock to which the indicator was applied. On the compound engine the pipes for the low-pressure cylinder were carried up to nearly the same level as those for the high-pressure, and they were consequently of greater length. The distance to the three-way cock was about 3 ft. from the high-pressure cylinder and 4 ft. from the low-pressure. The indicators for the two cylinders were thus located nearly side by side, in a convenient position for handling. Two Crosby indicators were used on the right-hand cylinders, and two Tabor on the left-hand. The springs of the indicators had been tested, and their scales verified for steam pressure. They were fitted with metallic marking points.

On the first series the number of revolutions of the drivers per minute was counted for a period of 10 seconds, and the number thus obtained was multiplied by six. The labor involved in determining the speed by this method, and the difficulty of obtaining satisfactory counts at high speeds, led, on the second test, to a trial of a tachometer made by Messrs. Shaeffer & Budenberger, of New York. This instrument was attached to the side of the smoke box and driven by a belt from the forward driving-wheel shaft through an intermediate countershaft placed under the boiler. This instrument worked with complete satisfaction. The same observer who took the speed and time made a note immediately afterwards of the boiler pressure, the pressure in the right-hand steam pipe, the amount of suction produced by the draught in the smoke box, the position of the reversing lever, and, on the first series of tests, the temperature of gases in the smoke-box. The gauge for determining the draught was a plain U-tube made of glass half filled with water. The pyrometer in the smoke box was a metallic one, the stem of which was 2 ft. long. It was inserted horizontally about 2 ft. in front of the tube sheet placed at a central point. This instrument was not used in the second test. The writer's "Universal Calorimeter," so called, was employed for determining the dryness of the steam. It was attached to the right-hand passage leading to the cylinder, at a point in the saddle casting just below the smoke box. The pipe for the attachment of the instrument extended into the passage and the inclosed part was perforated with ¼-in. holes. That part of the calorimeter called the "heat gauge" only was used, the drip-box being dispensed with. The readings were confined to the thermometer which gives the temperature of the steam below the discharge orifice. The quantity of steam used by the air pump for the brake system was determined by water-glass measurement, at a time when the engine was attached to a train of five cars, the train being at rest. One pump used at the rate of 255 lbs. of steam per hour, of which a small quantity, say one-quarter, may be charged to leakage of the throttle valve. This test was made on engine 848. For a three hours' trip the quantity of steam used would probably be about 800 lbs. in weight.

Four men were employed on the first series, and five on the second. Mr. Barrus, besides exercising a general supervision, took the measurement of the coal, and of the water on one side of the tank; and he also took the indicator diagrams on the right-hand cylinder, and observed the indications of the calorimeter, and the readings of the tachometer. Mr. E. H. Gowing took the diagrams from the left-hand side of the engine. Mr. Kenneth Rushton, of the Baldwin Locomotive Works, took the observations of speed, pressure gauges, draught gauge, pyrometer, and position of reversing lever, and the time when the throttle valve was opened and closed. The cab observations and mile-post record were taken by shop hands from the Baldwin Works.

The results may be considered in four principal sections: First, the general results, as shown by the measurements of coal and water for the various full trips, and deductions drawn therefrom; second, the results obtained from an analysis of the performance of the cylinders, apart from the engine as a whole, for selected periods of the runs; third, analysis of the diagrams, showing the capabilities of the engines under the various conditions of the tests; and fourth, miscellaneous results.

The general data and results of the various tests are given in tables 2 and 3.

The consumption of dry coal for a round trip on the compound varied from 13,484 to 14,171 lbs., and averaged 13,942. That on the standard engine varied from 15,875 to 17,077 lbs., the average being 16,389 lbs. Taking the average of the whole series of each set of tests, the difference in the consumption of coal per round trip in favor of the compound was 16,389 - 13,942 = 2,447, which is 14.9 per cent. of the larger quantity. The water used on the scheduled runs of the compound varied from 121.5 in. to 125.1 in., averaging 122.5 in. for the full series. The water used on the standard varied from 122.6 in. to 130.4 in., the average of the series being 126.4 in. The difference in favor of the compound engine between the average water consumption by the two engines is 126.4 - 122.5 = 3.9 inches, which is 3.2 per cent. of the larger quantity.

On the second series of tests, the consumption of coal

* Application has been made for a patent on this device.

for the accommodation run varied from 4,631 to 4,904 lbs., the average being 4,763, and that on the express run varied from 5,034 to 5,914 lbs., the average being 5,591. The water for the accommodation varied from 47.1 in. to 48.4 in., the average being 47.8 in., and on the express run from 43.1 in. to 49.3 in., the average being 47.1 in.

The various averages of tables 2 and 3, and other deductions, are given in table 5. This table is preceded by a summary of the cab observations, these being recorded in table No. 4.

The vent pipe was opened on the compound engine from 13.5 to 20 minutes, while on the standard it was opened a less time, viz.: 13 minutes. On the compound the blower was in use from 1 to 3½ minutes, while on the standard it was used from 8 to 20 minutes. On the compound the fire-door was open a considerable portion of the time to check the draught; while on the standard it was open from 4 to 16 minutes. All these observations show that the compound steamed much more freely than the standard.

Referring to Table 5, the compound evaporated 136.3 in. of water, and of this quantity an average of 13.8 in. was consumed at terminals (10.1 per cent. of total consumed). Assuming that an equal proportion of the coal was used at terminals, the quantity thus used amounts to 1,407 lbs. and this leaves 12,535 lbs. consumed in running. The throttle valve was open during the round trip, approximately 4.8 hours, which may be considered the length of time during which this quantity of coal was being consumed. The hourly consumption during the scheduled run would thus figure 2,612 lbs., which is at the rate of 103.7 lbs. per sq. ft. of grate surface per hour. This quantity also corresponds to a consumption of 4.1 lbs. of coal per horse power per hour, based on an average of 638.5 horse power.

A comparison between the quantities of water evaporated per pound of coal on the compound and standard engines shows a considerable difference in favor of the compound engine, and this difference accounts for the large difference in the saving of the compound engine over the standard engine, as shown by a comparison of the coal consumption and water consumption. The causes which lead to the difference in the evaporative performance of the two are hereinafter considered.

It is to be noted, in table 5, that the evaporation per pound of coal in engine 848, for the accommodation runs, was much higher than for the express runs on the second series of tests, the two quantities being, respectively, 7.38 and 5.96 lbs. The total length of time during which the throttle valve was open on the test of June 2 for the accommodation run was 2.32 hours. Allowing for the coal used at terminal stations as above, the consumption of coal on the road amounted to 4,026 lbs., and this, in 2.32 hours, gives an hourly consumption of 1,735 lbs., which is 69 lbs. per sq. ft. of grate per hour. This quantity also corresponds to a consumption of 2.9 lbs. per horse power per hour, based on the average of 589.6 horse power. The improved evaporative performance was due, in a measure at least, to the reduced rate of combustion.

In comparing the results of the accommodation runs with those of the express runs on the compound engine, it should be borne in mind that the former were made with coal taken on at Philadelphia, which, on the calorimeter trial, yielded 12,684 Th. Un. of heat per pound, while the latter were made with coal taken on at Baltimore, which gave 13,825 Th. Un. per pound. If the results were reduced to the same heat-producing basis, the showing would be even better in favor of the slower-running train than the figures given.

A comparison of the quantities of feed water consumed per horse power per hour by the two engines on the first series of tests shows 25.37 lbs. per indicated horse power per hour for the compound and 26.86 lbs. for the standard engine. The difference in favor of the compound is 1.49 lbs., which is 5.5 per cent. of the larger quantity. In view of this saving of 5.5 per cent., and of a saving of 3.2 per cent. in the gross quantity of water used for four round trips, the question arises as to what was the cause of the relatively larger saving, when based on the consumption of coal for the round trips, that saving, as already noted, being 14.9 per cent. It would at first sight appear that the difference was due to the greater efficiency of the boiler in the case of the standard engine, but when it is considered that the boilers were exact duplicates of each other, this explanation does not seem reasonable. It might be held also that there was a difference in the adjustment of the exhaust nozzles of the two engines, but the nozzles of the two engines are fixed. Although the exhaust nozzles and smoke-passages are duplicates in the two engines both in construction and adjustment, there is a difference in the conditions under which they work, as the standard discharges its steam at a higher release pressure than the compound. It may be presumed that the first impulse of the steam produces, for the time while it acts, more disturbance in the fire than the lower releasing pressure of the other engine. Careful measurements of the diagrams for the down trips of May 3 and 8 have been made, and it is found that the release pressure in the standard was 21.2 lbs. per sq. in. while in the compound the release pressure of the low-pressure cylinder was 16 lbs., the proportion of the stroke completed at the two points being, respectively, 0.86 and 0.93. An increase of 5.2 lbs., or nearly one-third, in the releasing pressure is sufficient to produce a marked difference in the action of the blast upon the fire, although the back pressure shown by these same diagrams at the lowest point is rather less in the standard than in the compound, the quantities being, respectively, 6.7 lbs. and 5.5 lbs. per sq. in. The effect of the different releasing pressure upon the average force of the draught is shown by a comparison of the indications of the draught-gauge on the same trips, that of the compound on May 3 being 3.7 in., and that of the standard on May 8 4 in. The increased draught in the standard engine breaks up the bed of coal on the grate to a greater extent, and causes a larger amount of loss in the small unburnt pieces of coal, which are discharged into the air. Although this action was noticeable at all times, it was specially marked when the standard engine was first started from a state of rest, before hooking up the reversing lever.

The economy in the consumption of fuel which the compound secured over the simple engine appears, therefore, to be due partly to the direct saving in the steam required to produce a given amount of power, and indirectly to the saving of fuel otherwise discharged through the smoke stack unburnt, due to the easier action of the blast upon the fire.

Passing to the tests of the second series, the consumption of water per horse power per hour on the express runs of May 28 and June 2 are respectively 27.22 and 25.69 lbs. The water consumed on the accommodation run of June 2 was 20.86 lbs. per indicated horse power per hour. The comparatively low consumption of the accommodation run is worthy of note, this quantity being about 19 per cent. less than the corresponding quantity for the

TABLE NO. 2. TESTS OF BALDWIN COMPOUND LOCOMOTIVE.

FIRST SERIES, PHILADELPHIA TO WASHINGTON. GENERAL RESULTS RELATING TO COAL AND WATER MEASUREMENTS.

Name and number of engine.....	Compound, No. 848.				Standard, No. 840.			
	April 30.	May 1.	May 2.	May 3.	May 6.	May 7.	May 8.	May 9.
Date of test..... 1890								
1. Weight of coal consumed for round trip, including that consumed at terminals (wet) (pounds).....	14,084	14,171	13,741	14,028	17,437	16,327	16,589	16,916
2. Weight of dry coal consumed for round trip (pounds).....	14,084	14,171	13,484	14,028	17,077	15,875	16,077	16,528
3. Weight of ashes and refuse withdrawn from ash pan (pounds).....	674	723	751		636	578	666	
4. Number of inches of water, measured in tank, used on the scheduled runs for round trip (inches).....	121.6	122	121.5	125.1	126.2	122.6	126.6	130.4
5. Number of inches of water, measured in tank, used at terminal stations, not including that used for blowing out the cinders (inches).....	13	14.8	14.6	12.8	17.5	15.8	15.2	14.1
6. Total number of inches of water used, measured in tank (inches).....	134.6	136.8	136.1	137.9	143.7	138.4	141.8	144.5
7. Weather.....	Clear.	Clear down; cloudy back.	Clear.	Clear down; cloudy back.	Rain down; cloudy back.	Cloudy down; clear back.	Rain down; clear back.	Clear; windy down.

NOTE.—The diameter of the exhaust nozzles on each engine during the whole series of tests was $3\frac{1}{2}$ in.

TABLE NO. 3.

SECOND SERIES OF TESTS. PHILADELPHIA TO BALTIMORE. GENERAL RESULTS RELATING TO COAL AND WATER MEASUREMENTS.

Name and number of engine.....	Compound, No. 848.				June 2.	
	May 27.	May 28.	May 28.	May 28.	May 28.	May 28.
Date of test..... 1890						
Portion of route.....	Philadelphia to Baltimore.	Baltimore to Philadelphia.	Philadelphia to Baltimore.	Baltimore to Philadelphia.	Philadelphia to Baltimore.	Baltimore to Philadelphia.
Kind of train.....	Accommodation.	Express.	Accommodation.	Express.	Accommodation.	Express.
1. Weight of dry coal consumed for the trip (pounds).....	4,845	5,031	4,631	5,914	4,904	5,824
2. Total weight of ashes and refuse withdrawn from ash pan (pounds).....	309	234		224	350	267
3. Number of inches of water, measured in tank, used during scheduled run (inches).....	47.9	43.1	48.4	49.3	47.1	48.8
4. Number of inches of water, measured in tank, used at terminal stations, not including that used for blowing out cinders (inches).....	8.3	6.8	10.1	7.2	9.2	6
5. Total number of inches of water used, measured in tank (inches).....	56.2	49.9	58.5	56.5	56.3	54.8
6. Weather.....	Clear.	Clear.	Clear.	Clear.	Clear.	Clear.

NOTE.—The diameter of the exhaust nozzles on the tests of May 27 and 28 was $3\frac{1}{2}$ in.; that on the test of June 2 was $3\frac{3}{4}$ in.; between May 28 and June 2 the valves were "squared up."

TABLE NO. 5. AVERAGE RESULTS PERTAINING TO COAL AND WATER MEASUREMENTS FOR FULL TRIPS.

Name and number of engine.....	Compound, No. 848.		Standard, No. 840.		Compound, No. 848.	
	Philadelphia to Washington and return, 266 miles. Six hours.	Washington Limited Express. Four between Philadelphia and Canton. Three between Canton and Washington.	Phila. to Balt. more, 96 miles. 3 hrs., 55 min. Accommodation. Three.	Baltimore to Phila. 96 miles. 2 hours, 35 minutes. Express. Five.	237 tons May 27 and June 2; 254 tons May 28.	254 tons May 28.
Route and distance covered by test.....						
Schedule time of trip.....						
Class of train.....						
Number of cars hauled.....						
1. Approximate weight of train, including engine.....	210.5 tons.*		149 tons			
2. Number of car miles traveled.....	13,942	979	16,389	238		
3. Average consumption of coal (dry) (lbs.).....	5.1		4.793	5.591		
4. Av. percentage of ashes (percentage).....		3.8	6.9	4.5		
5. Av. consumption of water per scheduled run (inches).....	122.5		126.4	47.8		
6. Av. consumption of water at terminals (inches).....	13.8		15.6	9.2		
7. Total average consumption of water for the trip (inches).....	136.3		142	57		
8. Total weight of water for the trip at 620 pounds per inch (pounds).....	84,506.	88,010	35,340	33,356		
9. Temperature of water in tank (degrees).....	60.	59	64	68		
10. Weight of water evaporated per pound of coal (pounds).....	6.06	5.37	7.38	5.96		
11. Equivalent evaporation from and at 212 degrees per pound of combustible (lbs.).....	7.69	6.7	9.56	7.49		
12. Pounds of coal consumed per car mile (pounds).....	14.2	16.7	16.6	11.4		

* This is the weight of the train running between Philadelphia and Canton; the weight between Canton and Washington is 186.5 tons. The weight on the down trips of May 6 and 7 from Philadelphia to Canton was 9.5 tons less than the quantity given.

express run of June 2. The reason for this superior result is found in the small quantity of steam which the indicator accounted for, this being 19.4 lbs., and this improvement is due to the superior manner in which the distribution of the steam in the cylinders was effected at the reduced speed at which the engine worked.

The effect of reduced pressure and a longer cut-off, in causing an increase in the quantity of water consumed, is seen in a comparison of the tests of May 28 and June 2 on the express runs. The boiler pressure on May 28 is about 20 pounds less than on June 2, and the cut-off one notch farther forward. A feature in the results of May 28, as compared with those of June 2 on the express run, is the effect which a difference in the size of the nozzles produced upon the draught. The nozzles on June 2 were $\frac{1}{2}$ in. larger than those on May 28, and the draught was increased from 3.9 to 4.8 in. The comparatively low boiler pressure of May 28, which was as high as could be maintained, indicates that a $3\frac{1}{2}$ in. nozzle is too small for the most satisfactory work on an express train of five cars. In this connection it may be added that on the first series of tests the $3\frac{1}{2}$ in. nozzles used on engine 848 were smaller than the actual requirements of maintaining the desired supply of steam, while the same size of nozzle on engine 840 was, on the other hand, too large.

Making a comparison between the record of the cards for the tests of May 3 and 8, the first thing which is noticeable is the difference in the initial pressures. A second noteworthy difference is seen in the proportion of the stroke completed at cut-off on the high-pressure cylinder of the compound, as compared with that of the standard engine. Whether the standard engine would have shown a better performance with a higher initial pressure, or whether the compound would have shown a different performance with a different adjustment of the point of cut-off, and, furthermore, whether the conditions in general, which control the performance of the individual engines, were such as to secure a fair comparison between the two, are matters of conjecture upon which the data of the tests throw little light. The fact stands out very plainly, however, that at the point where the steam is about to be released from the cylinders the quantity of steam consumed by the engine,

figured from the diagram, is about the same in one engine as in the other; and under these circumstances the quantity of steam actually consumed could not be expected to differ much in one case from that in the other.

The analysis of diagrams for the accommodation trip of June 2 shows in a measure the reasons for the improved performance of the compound. With about the same release pressure in both cases, a much larger amount of work is done at slow speed than in the other case. The mean effective pressure on the accommodation cylinder is about 58 lbs. per sq. in. for the high-pressure cylinder and about 24 lbs. for the low-pressure, while on the express run the mean effective pressure is about 44 lbs. for the high-pressure and about 19 for the low-pressure.

The loss produced by the increase of speed is due to the wire-drawing of the steam in its passage from the high-pressure cylinder through the valve and through the low-pressure cylinder. It appears to me that improvements can and should be made in the size and arrangement of the passages. In the matter of the admission of steam to the high-pressure cylinder, the operation of the engine is all that could be desired, nearly the full boiler pressure being maintained during the greater part of the period of admission. This cannot be said of the diagrams from the standard engine, which, at ordinary speeds, show a large amount of wire-drawing.

There is even more reason for a greater fuel saving in the case of the slow speed, when it is considered that the release pressure and the tendency of the blast to tear the fire is greatly augmented in the standard engine as the speed is reduced, while there is very little change in the compound. In the diagrams from the standard the mean release pressure at the high speed is 22.5 lbs., and at the slow speed 36.8 lbs. above the atmosphere; while the compound diagrams show precisely the same release pressure at both speeds. It is not easy to predict what effect this disturbing element in the combustion of the fuel has upon the problem, but the differences in the exhaust blast are such that it would be surprising if the loss from extra fire disturbance in the standard were not twice as great at the slow speed, as it was shown to be on the test at the fast speed. If such is the case, the

consumption of fuel in the compound at slow speed would be about 35 per cent. less than that in the standard engine. It will certainly not be overestimating the case if the expected saving of the compound engine at slow speeds is placed at 30 per cent. of the coal.

It would appear, when confining attention to the cut-off of the high-pressure cylinder, that the saving of steam produced by the compound is due to the more economical distribution of the steam which is afforded by the compound principle. The quantity of steam accounted for at cut-off shows, in every case, a much smaller figure than the actual water consumption. If, however, attention is confined to the steam accounted for at release of the low-pressure cylinder, it would appear that the saving of steam in the compound is due to the reduced amount of cylinder condensation, on account of the expansion being effected in two cylinders instead of one. There is in every case, whether at low or high speed, an increase in the quantity of steam shown in the low-pressure cylinder at cut-off. This is the same effect that would be produced by leakage of steam from the high-pressure cylinder into the low; and this difference is so marked that there is a suspicion that such leakage existed. It may be held that the difference referred to was produced by evaporation of water, which was condensed in the high-pressure cylinder. It does not seem reasonable, however, that the condensation in the high-pressure cylinder should be so large as that in the cylinder of the standard, and here the quantity accounted for was 0.86, as against 0.77 in the high-pressure cylinder of the compound. These questions, as to the causes which led to economy, are easy to discuss, but difficult to settle.

The normal indication of the calorimeter, when the engine was at rest, and steam of 117 lbs. pressure at the steam pipe was allowed to stand upon the instrument, was 280 deg. It is assumed that the normal at a pressure corresponding to the average of 142.8 for May 3 is 280, and the normal for a pressure of 114 lbs. is 265 deg. This last is taken at 262 deg. for the standard engine on account of the longer connections. With these normal figures, the cooling produced by the moisture in the steam on the compound was five degrees, and on the standard seven degrees. The cooling effect produced by one per cent. of moisture for this instrument is 20 deg. The quantity of moisture, therefore, in the steam tested was, for the compound 5.20 or 0.25 of one per cent., and that for the standard engine 7.20 or 0.35 of one per cent. These percentages are noticeably small, and they furnish satisfactory indications that the steam of both engines entered the cylinder in nearly a dry state. The instrument from time to time showed slight variations, but these appeared to be produced by variations in the pressure, rather than by variations in the condition of the steam.

The indications of the pyrometer are believed to be unreliable. Very little change was produced in the instrument by variations in the work of the engine, after once starting. When the pyrometer was tested, in comparison with two high-grade thermometers, one at each end of the stem, both being immersed in a current of superheated steam, the thermometers indicated an average of 70 deg. less than the pyrometer when this indicated 600. The maximum draught taken during the whole series of tests was 7.5 in., and this occurred on the express run of June 2, when the size of the nozzle was $3\frac{1}{4}$ in.

The principal facts brought out by the tests, and the important conclusions drawn therefrom, may be briefly summarized as follows:

1. The average consumption of coal for four round trips between Philadelphia and Washington was 14.9 per cent. less in the compound than in the standard engine; and the consumption of steam per horse power per hour during the selected periods of the runs which have been analyzed was 5.5 per cent. less in the compound engine than in the standard. The increased saving of coal over that of steam appears to be due to the improved action of the exhaust blast upon the fire, which the compound principle secures. These results were obtained under the severe conditions of service required in moving an express train at a rate of speed varying from 50 to 60 miles per hour.

2. The compound engine is more economical in the use of steam when running at slow speeds than at high speeds. The steam consumed when running at a speed of 257 revolutions per minute (50.4 miles per hour) was 25.69 lbs. per indicated h. p. per hour, while that at a speed of 176 revolutions per minute (34.5 miles per hour) was 20.86 lbs. per indicated h. p. per hour, a difference of 19 per cent.

3. The increase in the consumption of steam which accompanies an increase of speed in the compound engine is due to loss produced by the greater frictional resistance which the steam encounters in passing through the various ports leading to and from the cylinders. This loss appears to be more serious in the compound, with its double system of cylinders, than in the standard engine, with its single cylinder; and the conclusion may at once be drawn that the compound engine, in its present shape, will secure a greater saving of fuel when used on heavy express trains running at medium speed, on accommodation trains, and on freight trains, than when used on fast express trains. The tests furnish ample reason to expect a saving of coal on freight trains, and on accommodation passenger trains making frequent stops, of not less than 30 per cent.

4. In the construction of future engines, improvements in the form, size, or arrangement of the steam passages may doubtless be effected, which will reduce the frictional loss and further increase the economy. The use of a larger driving-wheel would be advantageous. Still another improvement may be made by reducing the size of the high-pressure cylinder to 11 in. and carrying a longer cut-off, the boiler pressure being increased at the same time to 180 lbs. By this means a wider port opening may be obtained without reducing the degree of expansion.

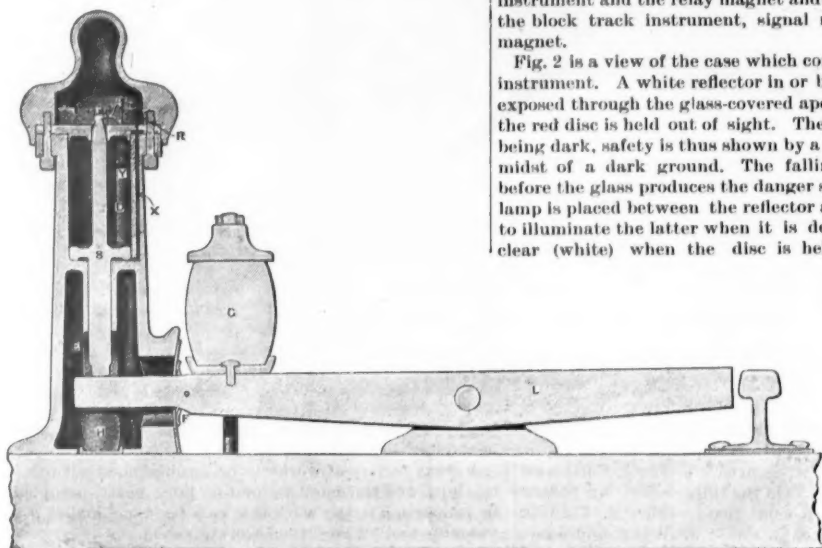
The compound steams freely, and without undue exertion on the part of the fireman. It starts from a state of rest quite as promptly as the standard engine. No difficulty is encountered in moving the fastest trains on schedule time, and in making up a reasonable amount of lost time. The terminal stations at Washington and Philadelphia were reached, on four successive days, either on time or a little ahead of time, although the train was frequently delayed at stopping places. The effect of the reciprocating parts, although weighing more than those of the simple engine, appeared to be inappreciable. The jar produced by these and other disturbances, so far as it could be measured by the feelings of a person riding either in a cab or on the pilot¹ was no greater in one engine than in the other. Altogether, judging from the manner in which the new engine operated during the progress of the tests, it meets all the mechanical requirements demanded by a successful locomotive.

The Hall Block Signal.

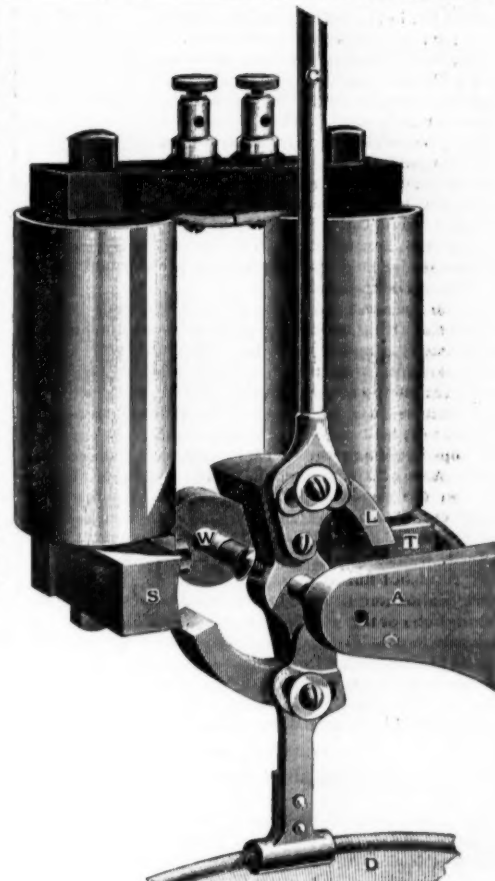
We show herewith some illustrations of the apparatus used in Hall's electric automatic block system, the several cuts giving numerous details not described in our previous articles on the subject. As our readers know, the Hall is a wire circuit system, the circuit being normally closed. The signal is a circular disc of silk stretched upon an aluminum ring and inclosed within a wooden case with a glass-covered opening. The front of this case being painted dark and showing some 10 square feet of surface to an approaching engineman, the signal is a conspicuous object. For the purpose of completeness, and to more clearly ex-

instrument, the contact between the spring and its anvil will be restored; but as the circuit is now broken at *p*, the signal will remain down at danger until the points at *p* are again brought in contact; that is, until the train, in passing out of the section, completes a circuit that shall energize electro magnet *r*. This is accomplished by the closing of the spring of the "clear" track instrument *O S*, which completes a circuit from battery *X* through wire 7, spring and anvil at *O S*, wire 8, electro-magnet *r*, wire 6, to the battery. The contact at *p* is now closed, and the signal circuit is complete, but the signal will remain at danger until the train has entirely cleared the "clear" track instrument from the fact that as long as the spring at *O S* is in contact with its anvil two circuits are completed, one through the clear track instrument and the relay magnet and the other through the block track instrument, signal magnet and relay magnet.

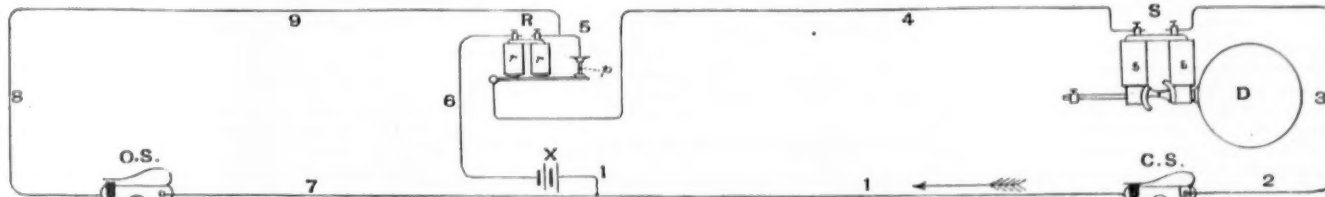
Fig. 2 is a view of the case which contains the signal instrument. A white reflector in or behind the case is exposed through the glass-covered aperture as long as the red disc is held out of sight. The front of the case being dark, safety is thus shown by a white disc in the midst of a dark ground. The falling of the red disc before the glass produces the danger signal. At night a lamp is placed between the reflector and the disc, so as to illuminate the latter when it is down and to show clear (white) when the disc is held up. A distant



HALL TRACK INSTRUMENT—Fig. 4.



HALL SIGNAL INSTRUMENT—Fig. 3.



THE HALL AUTOMATIC BLOCK SIGNAL—DIAGRAM OF ELECTRIC CIRCUITS—Fig. 1.

plain the details of the illustrations, we reprint the diagram and the main portion of the description and arrangement of circuits, which were shown in the *Railroad Gazette* of June 13. This diagram is shown in fig. 1 and shows the arrangement for operating a simple block signal circuit. At the entrance of the section is located the "block" track instrument, *C S*, the operation of which sets the signal at danger. The similar instrument at the other end, *O S*, is called the "clear" track instrument, its function being to restore the signal to the safety position. These two instruments are alike in principle and construction, except that the clear instrument stands normally open, while the block instrument stands normally closed. The "clear" track instrument is located 1,500 or 2,000 ft. beyond the end of the section, so that the longest train will be wholly clear of the section before the foremost wheel touches it, though the circuits are so arranged that the signal does not go to the safety position until the whole of a passing train goes over the instrument.



Hall Signal—Fig. 2.

R is the relay and *X* the battery. They may be located at any point within the block. *D* is the signal disc, described more fully in connection with figs. 2 and 3. The circuit is normally closed, and signal *D* is held at safety, as shown, the circuit being completed from the battery *X* through wire 1, track instrument *C S*, wires 2 and 3, electro-magnet *r*, wire 4, contact point *p*, wire 5, electro-magnet *r*, wire 6, to battery. A train in entering the section opens this circuit, the first wheel of the train breaking the contact between the spring and its anvil *O S*; electro-magnets *r* and *s* are demagnetized, signal *D* falls to danger, and the contact at *p* is broken. After the whole of the train has passed over the "block"

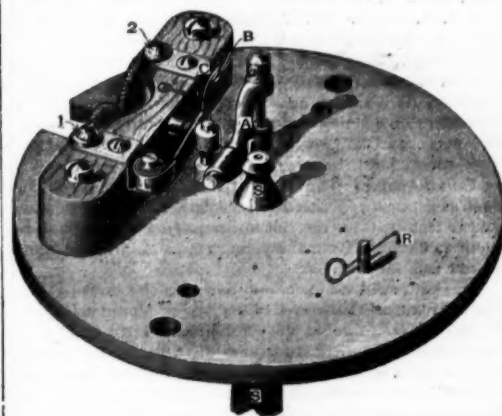
signal is of substantially the same construction, its disc being made of green silk instead of red.

Fig. 3 shows the construction of the signal instrument. *L* and the corresponding arm below it are the two wings of an armature which revolves on the shaft *W* between the prolonged cores *S* and *T* of the electro-magnet, and to which are attached the disc *D* and its counterweight rod *C*. The disc being heavier than its counterweight, the signal moves to danger by gravity. When the electro-magnet is energized the disc is drawn up out of sight by the rotary movement of the armature.

Figs. 4 and 5 show the track instrument, fig. 5 being an enlarged view of the top plate. The lever *L* upon being depressed by the wheels of a passing train forces upward the piston *S* moving in an air chamber *D*, and communicates motion to the key lever *A* (fig. 5) of the circuit closing apparatus. The upper and lower ends of the air chamber are connected with each other by a port *X*, so arranged that when the piston is forced upward a portion of the air above the piston is forced out through the port *X* and opening *Y*, which is placed a little below the top of the cylinder. When the piston has risen high enough to cover the opening *Y*, the communication with the lower end of the cylinder is cut off and the air remaining in the upper part is confined and constitutes a cushion, preventing the piston rod from being thrown forcibly up against the top cap. The piston rod extends up through the cylinder head, or top plate, as shown in Fig. 5. Upon being actuated by the lever *L* its beveled top engages the roller of the swinging arm *A*, which forces the spring *B* to a contact with its anvil *C*, thus completing a circuit between 1 and 2, the wire connections. When the piston has been raised by the action of a passing train, the air forced out by it is driven through the port *X* and enters the air chamber below the piston, so that when it falls back the air so introduced retards it in its fall, thus preventing injurious shocks. *R* is a valve for regulating this air pressure. The lower end of the piston rod moves in a closed chamber *E*, in which the end of the track lever works. This opening is closed by means of movable plates *F*, fixed on the lever, and working against the edges of the opening. The lever is confined between two rubber springs *G* and *H*, which are so compressed that any weight less than that imposed by the pressure of an ordinary car wheel fails to operate the piston.

As we have before stated, the Hall Company provides a modification of this system for permissive blocking, whereby a second train entering a section before the first has cleared it cuts out the electric circuit from the

signal behind it, so that signal can be cleared only by the last train of the series. For single-track working the company provides electric interlocking apparatus, the instrument being made on the principle of that shown in the *Railroad Gazette* of March 28, in connec-



Top Plate of Track Instrument—Fig. 5.

tion with the Hall highway crossing signal. By a simple arrangement a train entering a section sets a signal at danger in the rear, and at the same time the one at the other end of the section is locked in the danger position so as to stop trains from the opposite direction.

The Chignecto Marine Transport Railway.

In giving a brief report of progress on this work it may be well to restate some facts that we have published before as to the working organization. The engineers of the work are Sir John Fowler, Sir Benjamin Baker and Mr. H. G. C. Ketchum. Mr. Ketchum is Resident Chief Engineer. The plans are all from the office of Messrs. Fowler & Baker, in London. The chief contractors are Messrs. John G. Meigs & Son, of England, who sublet all the work but the machinery to Messrs. Dawson, Symmes & Ussher, who were contractors for the foundations of the Poughkeepsie Bridge. Mr. John F. O'Rourke, who was Chief Engineer for the Union

Bridge Co. in the building of that bridge, is Chief Engineer for the contractors in this work.

The work is progressing as steadily as could be wished, and will, with hardly any doubt, be ready for the formal opening early in 1892. The line is 17 miles long, and 15 miles is now graded. What remains is mostly heavy cuttings on which large forces are at work, and probably the grading will be practically completed this year. The ties and rails are all delivered, and about one mile of track is laid. Stone ballast will be used throughout; much of the material is already quarried. It is supposed that at least half the track will be laid this year, and the remainder next summer, so that the railroad proper is safely accounted for.

At the Amherst end 90 per cent. of the basin is excavated; the lifting dock excavation is about finished and the masonry is under way. One-third of it will be finished this year, we are told, and the rest by this time next year at the latest. The foundation excavation for the entrance gate to the basin is well advanced; the foundations will be built this year, and it is expected that the superstructure will be completed about the same time as the lifting dock. The hydraulic machinery is all on the ground, and it can easily be set up and tested before winter of next year. The entrance channel will be finished very quickly after the dyke can be opened.

At Tidnish, the northeast end of the line, the terminal work is about as advanced as at the Amherst end. The foundations of the lifting dock are completed and the masonry begun. Large quantities of building materials are on the ground. The moles surrounding the basin are about finished, while the dredging of the entrance channel and basin is progressing. This latter work will be completed before the dock is done.

Roadmasters' Association.

The eighth annual meeting of the Roadmasters' Association of America was held at Detroit on Tuesday and Wednesday of this week. Our report of the first day's proceedings has miscarried in the mails, but Wednesday's report, being as readable by itself as it would be in its proper place, is presented below.

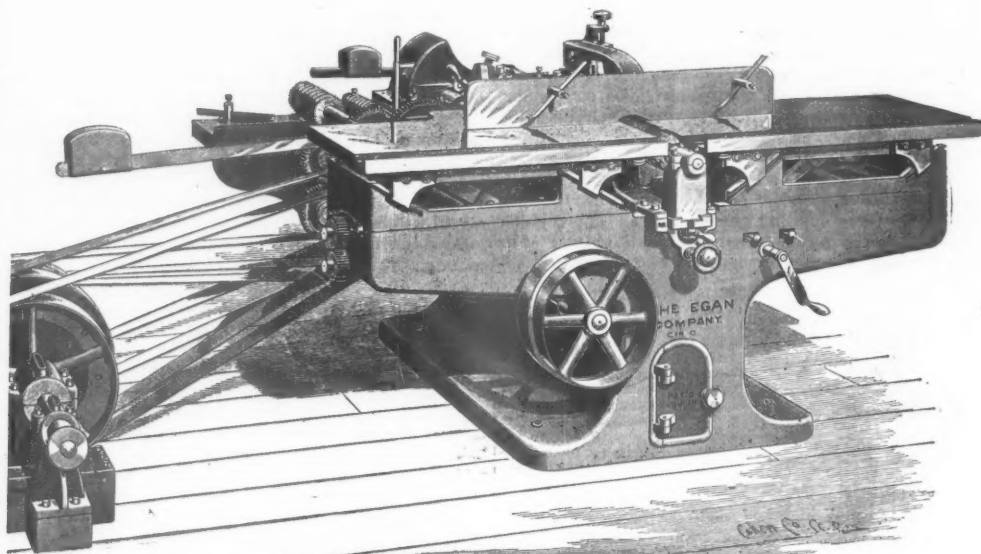
At the session of Wednesday morning the first report was that of the committee on interlocking, read by Mr. John Wynn (St. Louis Bridge Co.). Mr. Robert Black explained by blue prints the peculiarities of the different systems mentioned. The committee showed the Saxby & Farmer, Stevens and Johnson machines with various well-known appliances. The committee recommended that roadmasters familiarize themselves with interlocking apparatus to the end that they and their men be better qualified for the care of this very important part of track fixtures. The report was accepted, the blue prints to be engraved for publication in the proceedings. The discussion on the report turned principally upon the question of how far roadmasters and section men should have charge of interlocking.

A committee on resolutions was appointed as follows: N. F. Ellis, W. H. Stearns, J. A. Kerwin, John Tudhope and J. M. Meade. Mr. I. Burnet was made chairman of the committee on revising the constitution in place of J. W. Craig. The report of the committee on "instructing section laborers," which was referred back to that committee Tuesday, was again presented without change. Considerable discussion was had, developing principally the idea that the employment of assistant foremen would work badly because of the jealousy excited among section foremen. The report was amended to have such assistants appointed and discharged by the foreman and to remove the restriction requiring such appointment to be made from the young men. As amended the report was adopted.

Mr. Craig read an excellent paper on the statistics of the railroads of the world. This was accepted as a part of the proceedings of the convention. Mr. Black was appointed a committee to submit at the next convention designs for a badge. Mr. Craig moved that the Executive Committee be instructed to strike out of the report of the proceedings such part of Tuesday's discussion on the instruction of foremen as bore especially upon the question of wages.

Wednesday afternoon the first business was the presentation by Mr. H. W. Reed of the report of a new committee on preservation of cross-ties. The committee was appointed only Tuesday, and therefore had prepared but a very brief report. It was an excellent document, however, giving a review of the theory of decay of timber and of the methods of preservation heretofore employed. Mr. Reed read as a part of this report the article on the vulcanizing process published in the *Railroad Gazette* of Sept. 5. This process is controlled by the Haskin Wood Vulcanizing Co., of 42 Wall street, New York City. It was voted that the article be incorporated in the report and published as part of the proceedings of the convention. On motion the report was received as information and ordered printed.

The committee on revision having no report ready, it was voted to lay the matter on the table and discharge the committee. The convention then proceeded to the election of officers. Messrs. John Doyle (Delaware Lackawanna & Western) and John Sloan (Ohio, Indiana & Western) were nominated for president. Mr. Doyle



Wood Worker Side.

COMBINED UNIVERSAL WOOD WORKER AND MOLDER.

Made by THE EGAN COMPANY, Cincinnati.

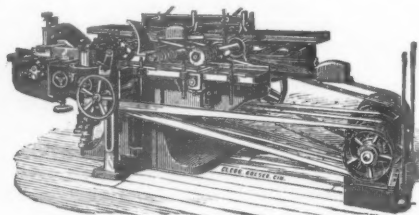
was elected. For first vice-president Geo. M. Brown (Flint & Pere Marquette), J. M. Meade (Atchison, Topeka & Santa Fe), and W. H. Stearns (Chicago & Northwestern) were nominated. On the third ballot Mr. Stearns was elected. For second vice-president J. Kindelan (Chicago, Milwaukee & St. Paul), J. Wynn and James Sloan (Chicago & Eastern Illinois), were nominated. Mr. Sloan was elected. Mr. J. P. Ramsey was re-elected secretary and treasurer. Mr. C. E. Jones (Chicago, Burlington & Quincy) was elected member of the Executive Committee.

On the invitation of the Northwestern Track and Bridge Association, Minneapolis was selected as the place of the next annual convention.

New Combined Universal Wood-Worker and Molder.

The machine shown herewith has just been brought out by The Egan Company, of Cincinnati, and is described as follows:

The two machines, a 9-in. universal wood-worker and an 8-in. four-sided molder, are on one frame, cast in one piece. They are driven by a patent combined countershaft, which has no loose pulley, and which requires but one belt from the line shaft, thus obviating the shifting of a belt to start or stop either machine. The arrangement of the countershaft is such that each machine is as independent of the other as if they were entirely separate. Both machines can be run at the same time, or each independently. Heads and bits can be put on or



Molder Side.

taken off; and they can be stopped, started and operated without the one interfering with the other in the least. The machine occupies but little, if any, more space than either a separate wood-worker or a separate molder.

The mandrel is made of steel, and has a lateral adjustment across the machine; this enables the operator, by a few turns of the hand wheel, to put the head to the exact place wanted, dispensing with adjusting the fence to an accurate line. The tables are long, and have a variety of adjustments which are easily accomplished. The tables raise and lower on inclines; both tables can be raised or lowered together separately, they can be raised or lowered with the circle of the head, or vertically, and each table can be moved horizontally to or from the head. All these adjustments are made from the working end of the machine. The patent bevel fence is made to adjust to positions suitable for all kinds of squaring up, beveling, cornering, etc. It is furnished with posts and springs to hold down the stock when necessary, and it can be placed so as to use the full width of the knife.

The molder side is made in three sizes, 8, 9 or 10 in. The bed is gibbed to the main column. The cutter heads are steel, slotted on four sides. The two side heads and lower head raise and lower with the bed. Each side head has a lateral adjustment, and can also be beveled. All four heads have a horizontal adjustment by means of the wheels in front. The outside bearing to the main

head is bolted to the frame and reaches to the floor, and is clamped to the bed.

A great variety of work can be accomplished with this machine, and the small amount of floor space occupied in proportion to the work that can be done makes it a valuable tool for any wood-working shop.

Improvements on the Pittsburgh, Cincinnati & St. Louis.

Not long since one of the editors of this journal had an opportunity to go over the Pittsburgh, Cincinnati & St. Louis on an inspection trip with Mr. J. J. Turner, the Superintendent, and several of his officers. The high condition of track and equipment, and the admirable organization and discipline of the operating department were obvious facts. The density of the traffic was also apparent to any one with his eyes open, but the great volume of business done, absolutely and as compared with other lines, can only be understood by an examination of the statistics.

The Pittsburgh, Cincinnati & St. Louis Railroad is a trunk line, both in its geographical relations to other lines and in the volume of business done. It receives the converging traffic from Chicago, St. Louis, Memphis and Cincinnati, and takes from Pittsburgh traffic to be distributed over the same lines. The volume of business is best measured by the gross earnings per mile. For the year 1889 these were \$28,200. The ton-miles per mile of road operated were 3,220,000. This was on a road of 193 miles, of which 87 miles was double track.

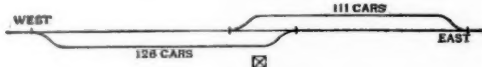
This was a heavy trunk line business. The gross earnings per mile of the Pennsylvania Railroad Division of the Pennsylvania Railroad were in the same year for 1,403 miles, \$26,270; the ton mileage per mile of road was 3,123,000. This included 459 miles of double track, but of course there was included in these operations a large extent of lines of comparatively light traffic. The earnings from the traffic on the main line of the same division, 427 miles, were \$68,509 per mile. The ton-miles per mile operated were 8,650,000. This was on a road all double track and having considerable third and fourth track. On the Lake Shore & Michigan Southern proper, and branches, excluding leased and proprietary lines, the earnings per mile in 1889 were \$20,636 for 350 miles of road. Of this 314 miles was double track. In the same year the Erie earned on 1,036 miles, \$19,902 per mile, and the ton mileage per mile operated was 2,274,000. On the New York Central & Hudson River the earnings on 1,421 miles operated were \$25,138 per mile, and the ton mileage per mile operated was 2,042,000. These operations cover, of course, a considerable extent of single track lines of comparatively light traffic, but they include 888 miles of double track, 316 miles of third track and 295 miles of fourth track.

It is not necessary to go further into this analysis to prove the statement with which we started out, that the Panhandle is in the volume of its business an important trunk line road. In order to do this business on a line mainly of single track it is necessary to operate it with great skill and to get out of the track all the service that it is capable of giving. Probably the limit of the capacity of the road, without further increase of double track, has been nearly reached. The volume of freight handled has increased 108 per cent. in five years, and the engine mileage has increased 26 per cent. The trains run over the single track average about 68 a day. The locomotive equipment is very heavy. The locomotives per mile are .701. On the Pennsylvania Railroad Division of the P. R. R. the locomotives per mile are .69. On the New York Central they are .647; on the Lake Shore .64 for

the whole system and on the Erie .51. The average locomotive equipment of the railroads of the United States for the year 1888 according to *Poor's Manual* was 0.2 per mile operated. Not only is the motive power of the Panhandle unusually great in number of locomotives, but also in the weight. All of the freight business is done with consolidation engines carrying 41 tons on the drivers. The trains hauled vary of course on different divisions, but the average number of cars is about 25 loaded, each way. On this road the anomaly is found of longer trains eastbound than westbound. This comes from the fact that so much of the traffic is coal taken west, the cars for which return east empty.

Considerable work has been done in reducing grades and straightening the track. For instance, the reduction of a grade near Wakatomika from .75 per cent. to .50 per cent. adds four cars per train on that division. Such improvements, however, have about reached their limit, and it has for some time been apparent that the road must be double tracked throughout. This will be done within the next four years, a portion of the money allotted for this purpose being spent each year. For physical reasons as well as financial ones the progress of the double tracking must naturally be somewhat slow. There are now on the line five tunnels to be double tracked. Work on two of these is now in progress. Work in the tunnel at Gould's, Ohio, was begun Sept. 1. This tunnel was built about five years ago to cut off about three miles of very crooked track, following the course of Cross Creek. The old roadbed remained nearly intact, and the work of relaying around was light. The traffic is now sent around by the old route, and the tunnel left free for uninterrupted prosecution of the work of double tracking.

As we have said, it is proposed to complete the work of double tracking in four years, but in order that the greatest amount of relief can be got from the money expended in any one year the work will not be done continuously from either end. Thus, a certain part of the money appropriated each year will be allotted to extending the system of "lap sidings" which has been introduced by Mr. Turner. The scheme of these sidings is shown in the diagram herewith. They are so arranged as



to overlap each other at the operator's tower, as indicated on the diagram. The eastbound siding has standing room for 126 cars, three 40-car trains with cabooses. The westbound siding has standing room for 111 cars, three 35-car trains with cabooses. When the track is to be cleared for passenger trains the freights run into these sidings and run with their heads to the operator's tower. The instant the order is given for the freights to begin to move again they can begin to pull out simultaneously east and west; and as soon as one train goes out the one standing in the rear of it pulls up to the operator's tower ready to receive its orders. The advantages of this simple and elegant arrangement are obvious. The east and west bound trains do not get in the way of each other, but move as independently as if on double track and no time is lost waiting for train orders. On so busy a road as this one the latter item is one of a good deal of importance. If a train stands a considerable distance from the operator's tower, the order for it to move will frequently be annulled by the time it has been carried to the train, and the head of the train has got up to the switch.

In the establishment of these lap sidings care is taken to so arrange them that the track laid can be economically incorporated into the double track wherever practicable. Thus, each pair of the lap sidings represents about two miles of the new double track. Lap sidings are frequently put in where a middle track will be required, in which case the existing main line track will become the middle siding and the new sidings will become parts of the new main line tracks.

Apart from the sidings arranged for saving time in passing, very important work has been done within the last year in the arrangement of setting-off sidings at division points, and particularly in sorting yards at Colliers and Columbus. These are both gravity yards, and we hope to give particulars of them in another article. The capacity of the Colliers yard is 443 cars.

A Swiss Compound Locomotive.

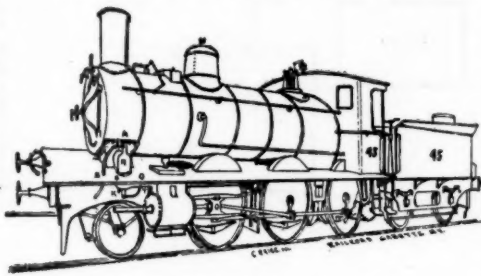
The "mogul" type of engine was introduced into Switzerland from the American prototype in 1875, and so fully are its advantages appreciated there that it is adopted by all the Helvetic engine builders as a standard for passenger service. Since the late Paris Exhibition the machines built by the Schweizerische Locomotiv & Maschinenfabrik of Winterthur have been made known pretty widely. This company exhibited a very fine engine at the big show, and the result has been that many engineering contemporaries have illustrated the ordinary single-expansion engines made by the firm.

The rough sketch accompanying, made from the actual machine exhibited, shows it to differ in many ways from, and to be altogether a finer locomotive than the

prevailing domeless types. It is one of a series ordered by the Yura, Berne & Lucerne Railroad, of which line R. Weyerman is chief of the tractive power.

There are two cylinders, 18½ in. and 25½ in. × 26 in. stroke. The distribution was calculated so as to equalize as much as possible the work of the steam in the two cylinders corresponding to the different degrees of expansion. This is attained by the Borries' system with unequal lengths to the suspension levers of the valve motion, which is of the Stevenson's link type placed between the frames and works on ordinary rocking shaft and levers, in connection with the slide valves on top of the outside cylinders.

The smoke box is carried on a saddle cast with the receiver. Referring to the illustration, R is the receiver, and the steam enters here just over the low pressure cylinder. In case, however, the high pressure piston is so placed that the steam cannot pass into the big cylinder by way of the receiver, it is, instead, brought along by a pipe T in direct communication with the high pressure valve chest. In its passage the steam forces up a valve—a sort of double piston on the rod K—and the way is then opened to the low-pressure cylinder and, by the



Swiss Compound Mogul Passenger Engine.

bottom piston, closed against the high. The big cylinder then commences to work. The pressure increases in the receiver until it reaches 68 lbs. per square inch, when the piston below the receiver is forced back in its cylinder—the lower part of which is always in communication with the atmosphere by a small pipe B. The engine then works double expansion.

The degrees of admission to the two cylinders in forward gear expressed in per cent. of volume are as follows:

Small cylinder.....	13	20	31	41	51	60	76
Large ".....	20	29	42	51	59	66	80

The details of the locomotive are finished in the very best manner. The boiler is of Krupp iron; seams welded inside and out; tubes of steel; the springs of two rear axles are equalized and connected on both sides by equalizing levers. In the same way the forward driver springs are equalized with those of the truck. The Westinghouse pump is fitted on the right-hand side of boiler, and operates brake blocks between the trailing wheels. In addition to the sand pipe there is an ejector for washing the rails to increase adhesion. The flanges of the truck wheels are lubricated by simple oil pads. The truck has a special articulated arrangement for automatic centering and radial movement in traversing curves.

Black Russia iron is used for all the sheathing; white metal, or nickel silver, for the whole of the boiler mountings, bands, pipes, etc.; working parts and cylinder covers are all finished bright, and the chimney (cast iron), smoke box and tender are painted black, with white lines.

As the low-pressure piston works through the front cylinder cover, a guard sheath covers it. A jacketing to the high pressure cylinder makes it of the same external diameter as the other. The general dimensions are as follows:

Cylinders.....	18½ in. and 25½ in. × 26 in. stroke.
Driving wheels.....	59 in. diameter.
Truck.....	37 " "
Rigid wheel base.....	12 ft.
Total.....	19 ft. 10 in.
Heating surface:	
Fire box.....	80.5 sq. ft.
Tubes.....	1,221.5 " "
Total.....	1,302.0 " "
Surface of grate.....	16 sq. ft.
Effective pressure.....	162 lbs.
Weight, empty.....	86,700 lbs.
" loaded.....	95,700 " "
" tender, empty.....	22,000 " "
Tender capacity, 1,560 galls. water and 9,240 lbs. coal.	

C. R. K.

Repairs and Renewals of Pile Bridges.*

I have been able to secure some data on this topic, and hope that other members may enlarge the list of roads here mentioned.

On the Chicago, Burlington & Northern 331 miles contain an average of 320 ft. of pile and trestle bridges per mile, an unusually large amount. The cost of repairs per lineal foot, in 1888, was 23 cents.

On the Western Division (in Colorado) of the Atchison, Topeka & Santa Fe, pile and trestle bridges with oak piles will last from 10 to 12 years, and their renewal costs from \$6 to \$7 per foot.

Through the courtesy of Mr. W. H. Earl I am able to

*Topical discussion by Prof. A. N. Talbot at the Fifth Annual Meeting of the Illinois Society of Engineers and Surveyors.

present the following summary of the cost of pile bridge repairs, excluding renewals, on the Atchison, Topeka & Santa Fe in Central Kansas.

Miles of road.....	816
Feet of bridges.....	59,501
" " per mile.....	72.9
Total cost, labor.....	\$3,324.31
" material.....	804.29
Cost per foot, labor.....	0.056
" material.....	0.0135

The above does not include some repairs from wrecks and fire; supervision included except engineering; second-hand material largely used; estimated at \$10 per thousand.

In connection with this Mr. Earl says: "Whenever a bridge needs extensive repairs I renew it, using the old material elsewhere; none of the material is wasted; it is all worn out in one way or another. The best of it goes to repair other old bridges, then when they are renewed all the material is old together. Of course, if we had no use for the material this plan would not be economical, but we are often short of second-hand bridge stuff than we have a surplus. We estimate the value generally at \$10 per thousand. We renew our pile bridges when seven to ten years old, mostly from eight to nine years. Piles generally go first, and there are generally helpers alongside of piles by the time we renew. Sometimes where a bridge has a good top and not over 60 ft. long we put in new piles and caps, then move the entire top to fit. Longer than 60 ft. top has to be taken to pieces.

"I now require a systematic inspection of every bridge in all its parts as often as once in 30 days. The inspector enters in a book each bridge number, date and condition, noting in detail any defects; signs book at end of trip, sends it to the general foreman, who in turn sends it to me. I copy the notes and date of inspection in my office bridge books. I have two general foremen, and it takes a man under each about 20 days to get over the division. In addition, section foremen have track-walkers examine bridges daily for broken stringers, that being the only thing liable to give out suddenly. We still have a good many stringers split from the shoulder; generally a bolt put through makes them all right again. I think you will admit that we don't take many chances on bridges."

Floating the Ohio Connecting Bridge.

[WITH AN INSET.]

In our issue of Aug. 22 appeared a very full account of the erection and floating into place of the main span of the Ohio River Bridge of the Ohio Connecting Railway just below Pittsburgh. We are now able to give four views from photographs showing the work in various stages. These views (on the accompanying inset) show (1) the span and trestle staging in position on the piling along shore; (2) an end view after one barge had been put under; (3) the span and trestle staging floating on the barges, and (4) the span in position.

There is little to add to our earlier account, and the construction of the false works and method of floating the mass are well shown in the illustrations.

The trestle bent with vertical posts, which appears in the view, showing the structure still on the piling, was removed before the floating, leaving the end of the span overhanging, as shown in the other views.

Some of the particulars of the construction of the false works are reproduced from the *Railroad Gazette* of Aug. 22, with a few added details. The bents of the false work were spaced 26 ft. 1½ in. centres to correspond with the half-panel points of the span. The panels are 52 ft. 3½ in. Each bent consists of five piles cut off 16 ft. above the water, and five posts. The middle post of each bent is vertical; the intermediate posts were battered about 1 in. 4.34, and the outside posts about 1 in. 2.17. The height of the false works was 73 ft. 2 in. from the pool level to the top of the stringers. The base of the rail is 79 ft. 7½ in. above pool level. The posts of the trestle are 12 in. × 12 in., the caps 12 in. × 14 in., the girts 12 in. × 12 in., and the stringers 8 in. × 14 in. The diagonal bracing is 3 in. × 10 in. Iron tie rods, with turn-buckles, were put in, covering groups of bents, to give longitudinal stiffness. Substantial horizontal bracing was also put in at the foot of the trestle, and the whole structure was very rigid. Beneath the trestle and above the piles were placed iron I-beams, as described in the earlier article. These I-beams spanned each alternate bay of the piling. They were placed in pairs, and there were five pairs for each bay. These I-beams were 20 in. × 64 lb. In the bays spanned by the I-beams were placed the coal barges when the time came for floating the structure. Stagings were built up in each barge, and on these the structure was carried when the barges rose. The arrangement of the barges and these stagings is shown in the illustrations. The barges were 25 ft. × 130 ft. Stringers of 6 in. × 8 in. timber ran from barge to barge across the bows, and when the barges were hauled clear of the piles others were put across the sterns, but no diagonal bracing was put in between the barges. No distortion of the structure in any direction was observed during the operation of floating into place.

The method of handling the structure afloat has already been fully described. It is well to add, however, that it was handled entirely by lines and was not pushed by steamboats, as was stated by some journals.

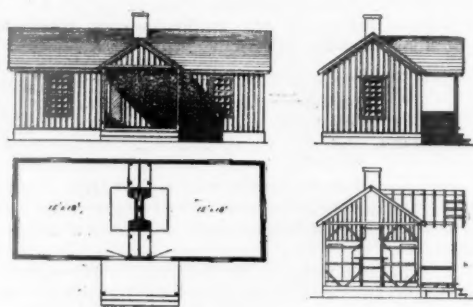


Fig. 1.

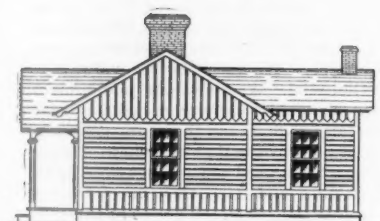


Fig. 2—End Elevation.

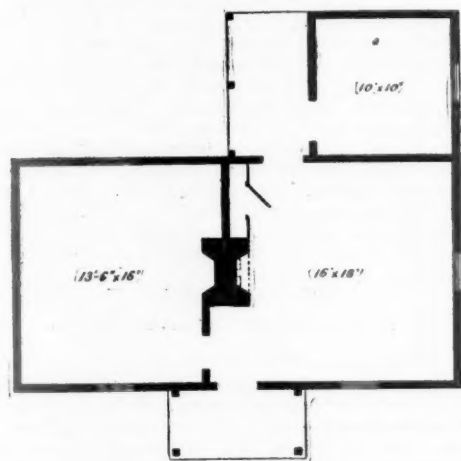


Fig. 3.

STANDARD SECTION HOUSES.

at the time.* The barges were pulled clear of the piles by hand lines, made fast to the piles and hauled by men on the barges. Once out in the stream the lines were worked by winding engines. It had been proposed to push the mass by steamboats, and for that purpose several were in waiting. This plan was given up, however, and the slower method of handling it entirely by the lines was used. Some hours could have been saved had the steamboats been used, and, as the wind was light most of the time and there was but little current, this would probably have been perfectly safe. Of course it was safer to keep the connections unbroken in all directions, as was done by means of the lines.

Buildings and Structures of American Railroads.†

No. 3.—SECTION HOUSES.

BY WALTER G. BERG.

The name "section house" on a railroad generally applies to the dwelling houses supplied by the railroad company for the use of the men employed, more particularly on the track, as foremen or track hands. It is very essential that the men employed on track work live on their section, or as close to it as feasible, so as to be always on hand in case of emergencies and to avoid loss of time in going to and from their work. Where the route of a railroad does not pass through thickly settled districts, a railroad company is forced, for the reasons mentioned, to build special houses, known as "section houses." The distinction between these and "dwelling houses for employes" lies mainly in the different styles and sizes of the two, the section houses being usually much smaller and built on a cheaper scale than the dwelling houses proper. The latter will be grouped under the heading of "Dwelling Houses for Employes."

The general requirements for a section house are that it be cheap and built to suit the local climatic conditions. There are two kinds in use, namely, one for the accommodation of one or more families and the other for a number of men. The section foreman and the married hands, who have their families with them, generally live in the first mentioned style of house, while the single men or

men without their families are expected to club together under one roof.

Section houses, probably in all cases, are frame structures, roofed with shingles or tin, and sheathed on the outside with upright boards or horizontal weatherboarding. According to the importance and the locality the exterior is more or less elaborate. The designs vary in the different sections of the country, and the influence of the prevailing types of farm house architecture on the designs adopted for different localities is clearly perceptible. According to the fuel, large, old-fashioned chimneys for wood fires or brick and iron flues are used.

In the Northeastern states the country is generally so thickly settled that the railroad companies have not paid much attention to adopting standard section house plans. Where buildings of that character are required at a few isolated points along the line, it is very easy to

ble means to obtain good ventilation in and around the building.

It would be impossible to undertake to prescribe any particular style or certain structural methods as the best, as the local conditions and circumstances in each particular case preclude all possibility of drawing summary conclusions. Descriptions of the following section houses are presented as illustrative of the subject:

Two-Room Section House, East Tennessee, Virginia & Georgia Railroad.—The standard two-room section house of the East Tennessee, Virginia & Georgia Railroad, shown in fig. 1, is a one-story frame building, 41 ft. x 16 ft., with a double pitched roof and a small entrance porch. This standard is intended more for the accommodation of a number of men than for a section foreman or a man with a family. The ground plan consists simply of two rooms, each about 15 ft. x 20 ft. There is one common chimney at the centre of the house leading up from large fire-places in each room. The rooms have each an entrance door from the front porch; otherwise there are no doors in the building.

The building is roofed with shingles or tin, and sheathed on the outside with upright boards and battens. It is not ceiled on the inside. The height of the frame is 10 ft. from sill to plate.

The principal timbers used are as follows: Sills, 6 in. x 8 in.; corner posts, 6 in. x 6 in.; door and window studs, 3 in. x 6 in.; nailers, 3 in. x 6 in.; plates, 4 in. x 6 in.; rafters, 2 in. x 6 in., spaced 24 in. centres; ridge plate, 1½ in. x 8 in.; tie beams, 2 in. x 8 in.; roof boards, 1 in.; outside sheathing, 1 in. x 10 in., with ¾ in. x 2½ in. battens; floor joists, 2½ in. x 12 in., spaced 18 in. centres, spanning 15 ft.; flooring, 1 in., T and G boards; windows, double sash, each sash 6 lights, 10 in. x 12 in.; doors, 3 ft. x 7 ft.

Three-Room Section House, Chesapeake & Ohio Railway. The three-room section house of the Chesapeake & Ohio Railway, shown in figs. 2 and 3, is a one-story, "L" shaped, frame building, 33 ft. x 17 ft., the wing being 10 ft. 6 in. x 11 ft. It has a front and a rear porch, two front rooms, respectively 18 ft. x 16 ft. and 13 ft. 6 in. x 16 ft., and a kitchen, 10 ft. x 10 ft.

The building is roofed with tin or shingles, covered outside partly with upright boards and battens and partly with beveled weather boards, which arrangement, in connection with the corner, base and string boards, adds materially to the appearance of the building. The inside is plastered. The height of the frame is 11 ft. from sill to plate.

The principal timbers used are as follows: Sills, 6 in. x 8 in.; corner posts, 4 in. x 4 in.; studding, 2 in. x 4 in.; nailers, 2 in. x 4 in.; plates, 3 in. x 4 in.; rafters, 2 in. x 6 in., spaced 24 in.; ridge plate, 2 in. x 8 in.; ceiling joists, 2 in. x 10 in.; floor joists, 2 in. x 12 in., spaced 18 in. centres and spanning 16 ft.; flooring, 1 in., T and G boards; windows, double sash, each sash six lights, 10 in. x 16 in.; doors, 3 ft. x 7 ft.

The cost of this building is stated to be about \$800.

Section House, Atchison, Topeka & Santa Fe Railroad.—The standard section house of the Atchison, Topeka & Santa Fe Railroad, known as Class No. 4, shown in fig. 4, is a very plain but practical and economical design. It is a one-story, "T" shaped, frame building, 14 ft. x 31 ft., with a wing, 14 ft. x 14 ft. No covered porches are provided, but there is a platform on the rear with a washing shelf. The front door leads into a room 18 ft. x 13 ft., with two bunks in it, each bunk 6 ft. 6 in. x 4 ft. 3 in. At the end of the main portion of the building is a room, 11 ft. 6 in. x 13 ft., connected only with the kitchen. The kitchen on the rear is 13 ft. x 13 ft. A cellar under the kitchen is entered by a small trap door in the floor of the kitchen.

The building is roofed with shingles and sheathed out-

build a small dwelling house similar in its principal features to the general style of country houses in vogue at each place. In the Western sections of the country the standard designs, while practical and economical, are as plain and as cheap as possible. In the South-eastern states the designs indicate a tendency to finish the buildings more comfortably and neatly.

This difference can probably be traced to the character of the employes to be accommodated. In the West the class of the employes on a section is of a more roving nature than in the Eastern states, where the men attach themselves more permanently to a railroad and where there is, hence, more of a disposition on the part of the railroad management to provide pleasant homes for them.

The changes of design caused by the climatic conditions are clearly shown by comparing the standards of the Northern Pacific Railroad, where everything tends to keep the cold out, with the standard of the Savannah, Florida & Western Railroad, which introduces all possi-

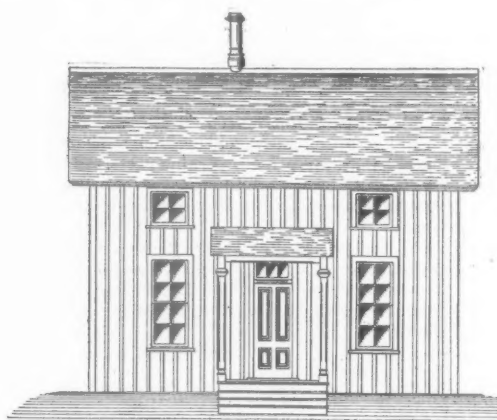


Fig. 6—Front Elevation.

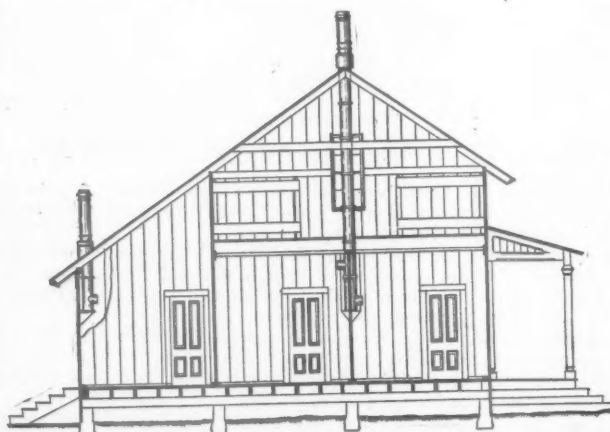


Fig. 7—Section.

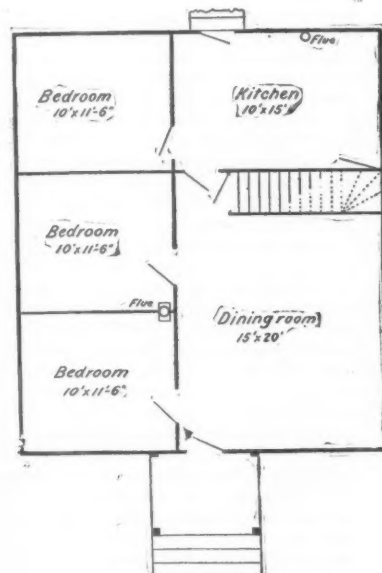


Fig. 8—Ground Plan.

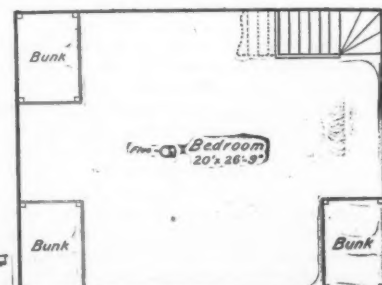


Fig. 9—Second Floor Plan.

STANDARD SECTION HOUSES.

* The journals referred to are Pittsburgh daily papers. No other technical journal than the *Railroad Gazette* has yet published any account of this remarkable work other than a brief news item.

† Copyright 1891, by Walter G. Berg, and condensed from a forthcoming book on the subject.

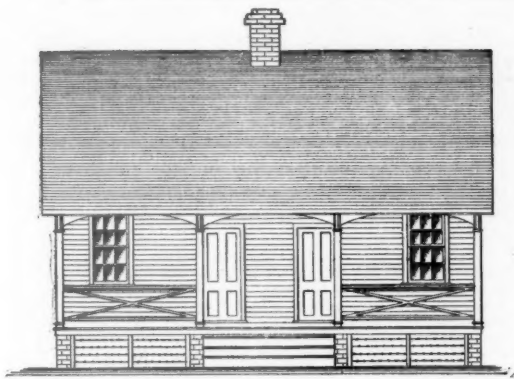


Fig. 10—Front Elevation.

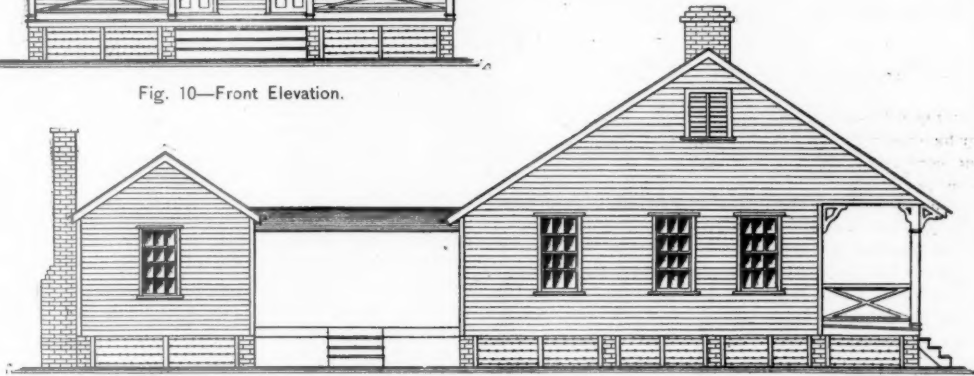


Fig. 11—Side Elevation.

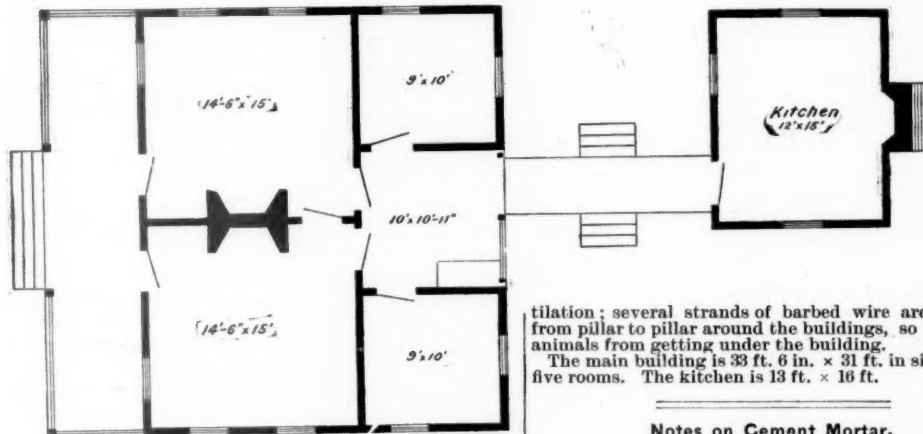


Fig. 12—Ground Plan.

STANDARD SECTION HOUSES.

side with $\frac{3}{4}$ -in. drop siding; the interior is wainscoted 3 ft. high from the floor, and the balance plastered with two coats, the second or brown coat being troweled smooth. The standard plan shows a foundation of round logs set on mud sills and buried in the ground. The height of frame from sill to plate is 10 ft.

The principal timbers are as follows: Sills, 2 in. x 6 in., flat; floor joists, 2 in. x 8 in., spaced 16 in. and spanning 13 ft.; studding, 2 in. x 4 in.; plates, 2 in. x 4 in.; rafters, 2 in. x 4 in., spaced 24 in. centres; ceiling joists, 2 in. x 4 in., spaced 16 in. centres.

White Men's Section House, Northern Pacific Railroad.—The white men's section house of the Northern Pacific Railroad, designed by Mr. C. B. Talbot, shown in fig. 5, is a very cheap, one-story, frame building without any studding. The standard plan shows it to be 18 ft. x 24 ft., without any porches or platforms around it. There are four rooms, namely, a living room, 11 ft. x 12 ft., two bed rooms, each 7 ft. x 12 ft. and a kitchen, 11 ft. x 12 ft.

The building is roofed with cedar shingles on boards and sheathed outside with two layers of boards, laid close, with building paper between them. The interior of the rooms is ceiled with 1 in. boards, with a layer of building paper between the boards and the ceiling joists. The flooring is double, with building paper between the two layers. The clear height of the rooms is 8 ft. 8 in.

The principal timbers used are as follows: Sills, 6 in. x 8 in.; plates, 2 in. x 6 in., upright and nailed against the boarding; rafters, 2 in. x 6 in., spaced 24 in. centres; floor joists, 2 in. x 8 in., spaced 16 in. centres and spanning 9 ft.; ceiling joists, 2 in. x 6 in., spaced 24 in. centres; doors, 2 ft. 6 in. x 6 ft. 6 in.; windows, double sash, each sash four lights, 12 in. x 14 in. There is no studding in this design, the double boarding outside connecting the plate and sill.

Two-Story Section House, Northern Pacific Railroad.—The standard two-story section house of the Northern Pacific Railroad, shown in figs. 6, 7, 8 and 9, is a plain, two-story, frame building without studding; the main portion of the house is 26 ft. x 20 ft., with a kitchen annex, 26 ft. x 10 ft. There are five rooms on the ground floor, namely, one living room, three bed rooms and a kitchen. The second floor forms one large common bed room with a number of double bunks, 6 ft. 6 in. x 4 ft. 6 in. Where desired, this second floor can be divided into rooms by appropriate partitions.

The building is roofed with shingles on boards, and sheathed outside with two layers of boards with building paper between them. Earth is packed against the foot of the building to exclude the cold, so far as possible, from getting under the floor.

The principal timbers used are as follows: Sills, 6 in. x 8 in.; enter ties, 2 in. x 8 in., upright; plates, 2 in. x 6 in., upright; rafters, 2 in. x 6 in.; ties, 1 in. x 6 in.; floor joists of ground floor, 2 in. x 8 in., spaced 24 in. centres and spanning 13 ft.; floor joists of second floor, 2 in. x 10 in., spaced 20 in. centres; inside partitions

double 1 in. boards; inside doors, 2 ft. 6 in. x 6 ft. 6 in.; outside doors, 2 ft. 8 in. x 7 ft.

Section House, Savannah, Florida & Western Railroad.—The standard section house of the Savannah, Florida & Western Railroad and of the Charleston & Savannah Railroad, shown in figs. 10, 11 and 12, is particularly well suited for Southern climates; in fact, the design is practically copied from a similar type of Southern farm houses. The house is a one-story, frame building with a high garret well ventilated at the gable ends with louvers. A large porch extends along the entire front of the house. The kitchen is in a separate building, 15 ft. distant from the rear of the main building, the two being connected by a covered walk.

The house and kitchen are set on brick or stone pillars. The space below the floor is left open to give ven-

made with Rosendale cement only, and acquires great subsequent strength, due to the Portland cement contained in it. The strength of the mixed mortar is almost exactly a mean between that of the two mortars separately.

If the choice of the cement is not determined by any of the preceding conditions, the question then becomes one of relative strengths and relative prices. For example, an examination of a table of the strength of cement mortars will show that at the end of a month the strength of a neat Rosendale mortar is equal to that of a 1 to 1½ Portland mortar, a 1 to 1 Rosendale is equal to 1 to 3 Portland, and a 1 to 2 Rosendale is equal to a 1 to 5 Portland. The cost per cubic yard of the last two mortars will be about as follows:

Rosendale 1 to 2, \$3.23; Portland 1 to 5, \$4.32. This shows that, under these conditions, the Rosendale, strength for strength, is the more economical.

In conclusion, allow me to mention one little fact, by means of which a mortar may be made impervious to water. Mortar may be made practically non absorbent by the addition of alum and potash soap. One per cent., by weight, of powdered alum, is added to the dry cement and sand, and thoroughly mixed, and about 1 per cent. of any potash soap (ordinary soft soap made from wood ashes is very good) is dissolved in the water used to mix the mortar. The alum and soap combine and form compounds of alumin and the fatty acids, which are insoluble in water. These compounds are not acted upon by the carbonic acid of the air, and add considerably to the early strength of the mortar, and somewhat to its ultimate strength. With lime mortar the alum and soap has a slight disadvantage, in that the compounds which render the mortar impervious to water also prevent the air from coming in contact with the lime, and consequently prevent the setting of the mortar. On the other hand, the alum and soap compounds add considerably to both the early and ultimate strength of the mortar. This mixture could be advantageously used in the mortar of outside walls, for masonry in wet places, for pointing mortar, for the plastering of cellar and basement walls, for lining cisterns, etc. The efficiency of the alum and soap compounds is shown by the fact that the walls of the Croton reservoir, in Central Park, New York City, were rendered impervious by simply washing them four times alternately with the alum and the soap solutions. Before being coated the walls allowed the water to pass freely. Four coatings—two pairs—made a common brick absolutely impervious under a forty-foot head of water. The use of the alum and soap, as above, would in all cases greatly diminish, and in most cases entirely prevent, efflorescence or "whitewash," which so frequently disfigures brick walls.

Baldwin Engines for the St. Clair Tunnel.

The Baldwin Locomotive Works, Philadelphia, have the contract for building four decapod tank locomotives for service in the St. Clair tunnel. These engines are to have cylinders 22 x 28 in., five pairs of driving wheels 49 in. in diameter outside of tires, and will weigh in working order, including 1,800 gallons of water in the tank, about 180,000 lbs. They will have boilers 74 in. in diameter, carrying 180 lbs. steam pressure. The firebox is 11 ft. long by 3½ ft. wide. There will be about 280 tubes, 2½ in. in diameter, and 13 ft. 6 in. long. The cab is placed centrally over the boiler with foot plate and coal box at the rear of the boiler. The wheel-base is 18 ft. 3 in. As the track through the tunnel is straight the engines are not required to pass curves on the main line, and are only required to enter ordinary sidings. Additional play will be given the tires of the extreme driving wheels. The second and fourth pairs of driving wheels will be flanged with the usual play, and the distance between their centres is 8 ft. 9 in. The tires are to be secured by Mansell retaining rings and each engine will be fitted with two sandboxes and two headlights, a Cooke steam bellringer and the Westinghouse automatic brake with equalized driver brake fixtures acting on all the wheels. The fuel will be anthracite coal or coke. The load which these engines are intended to haul is about 700 tons and the grades are 105.6 per mile. They are to be delivered in January.

Pennsylvania Passenger Car Yard at Chicago.

The Pennsylvania Company has entirely remodeled its passenger car yard in Chicago. A neat brick building has been erected at one end of the yard, in the lower story of which storage batteries are cleaned and repaired and various stores are kept. Above these rooms are offices; the tracks are spaced an unusual distance apart. The tracks are all laid with very heavy rails and the whole yard is floored with wood, even between the rails of each track. Just outside of each rail the flooring is composed of two heavy planks 1 ft. wide. Beyond these and in between the rails the flooring is composed of narrow strips about 4 in. wide, spaced about ½ or ¾ in. apart. This floor is not laid in contact with the earth or ballast, but is a few inches above it. The planks are all laid parallel with the track. The whole yard is lighted by arc lights placed upon high poles. It is piped with water, steam and compressed air; the steam and compressed air pipes are placed in the same boxing, which is located but a short distance below the floor. The water pipes are located at a depth of about 3½ ft. Connections to the cars can be made between each pair of tracks and at intervals equal to the average car length. The steam pipe has a branch which connects with the upright pipe from the water main, and by regulating the water and steam valves any required temperature of water may be obtained for washing the cars. The lavatory tanks can be filled from the same water pipe, the steam being shut off.

The water used is obtained from the city mains. The steam is taken from a plant which has been erected for that purpose, and for running the electric lights and furnishing compressed air. The building in which this apparatus is located is a new one, and has been erected near the roundhouse. In one end of this building there is a large stationary boiler of the locomotive type, with a Belpaire fire box, and in the same room there is an air compressor, which maintains the required pressure of air on the pipes throughout the yard. The steam used in the yards is taken directly from the dome of this boiler. In an adjoining room there is an 80 H. P. Ball engine, and this is at present connected to a 30-light dynamo. At present 28 arc lights are run. Several changes are being made at the roundhouse. A new 66-ft. turntable has been put in, on which may be turned special cars or other long vehicles. The roundhouse is lighted by electricity from the same plant which lights the passenger yard. The smokestacks are all being moved toward the outer circumference of the roundhouses, as the doors cannot be closed behind the engines in their present position.—*Railway Review*.

Notes on Cement Mortar.

What follows is from a short paper on the above subject by Prof. I. O. Baker, which appears in the report of the last annual meeting of the Illinois Society of Engineers and Surveyors.

Nearly all masonry is laid in lime mortar, in which case the mortar is the weakest link, both in strength and in durability.

Many private builders reinforce lime mortar by the addition of hydraulic cement, and many railroads employ cement mortar in all masonry structures, and cement mortar is generally used for sewers, arches, and important masonry constructions; but it is nevertheless true that altogether too much lime mortar is used. Under most favorable circumstances as to exposure to the atmosphere, lime mortar will attain a maximum strength of about 50 lbs. per square inch, as compared with a possible 300 for Rosendale and 500 for Portland.

The addition of cement to lime mortar adds to its strength—the strength of the resulting mortar being intermediate to the strength of the two separately. However, it is not certain that it is true economy to mix lime and cement. As far as strength is concerned, the lime, under favorable circumstances, is little better than an equal volume of sand, and under water, in damp places, or in thick walls, it is not as good. Lime mortar taken from the walls of ancient buildings has been found to be only 50 to 60 per cent. saturated with carbonic acid after nearly 2,000 years of exposure. Lime mortar 2,000 years old has been found in subterranean vaults in exactly the condition, except for a thin crust on top, of freshly-mixed mortar.

The strength and durability are unquestionably mainly dependent upon the mortar, and it is highly illogical to insist upon a high quality of stone or brick, or of stone instead of brick, and then use common lime mortar. Experiments show that an increase of 50 per cent. in the strength of the brick shows no appreciable effect on the strength of the masonry, and that the substitution of a Portland mortar for a lime mortar adds 70 per cent. to the strength of the masonry; and also that the substitution of a Rosendale mortar for one of lime adds 50 to 60 per cent. Probably the difference in durability between cement mortar and lime mortar is considerably greater than their difference in strength. Ours is so cheap that it could profitably be substituted for lime in the mortar for ordinary masonry.

If cement is to be used, it then becomes a question whether Portland or Rosendale should be preferred. If great ultimate strength is required, then Portland cement must be employed; but if a quick-setting mortar is desired, then Rosendale cement must be employed. Unless a quick-setting mortar is required, there is a decided advantage in using Portland, for, as it hardens more slowly, it is not so liable to set before reaching its place in the wall. This is an important item, since with a quick-setting cement any slight delay might necessitate the throwing away of a box of mortar, or the removal of a stone to scrape out the partially-set mortar.

It is sometimes very desirable to have a cement which will set more quickly than Portland, and finally attain a greater strength than Rosendale. Under such circumstances, a mixture of Portland and Rosendale can be used. Such mortar sets about as quickly as if



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Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The second section of the northbound Montreal express on the New York Central was derailed by a malicious obstruction near Castleton, four miles south of Albany, about midnight, on Sept. 4. The train was running about 30 miles an hour and the cars were overturned and thrown about in great confusion, one landing on its roof and one being thrown directly crosswise of the ditch. Only three passengers were injured, and for this fortunate result the very strong construction of the cars, all of them being sleeping cars, may be given the credit. As our readers know, there have been several other attempts at train wrecking on this road since the strike of Aug. 8, and some of them have been successful in derailing freight trains. The company had offered \$1,000 reward for the detection of wreckers before, but on the occurrence of the Castleton wreck at once announced a \$5,000 reward for the criminals. Six men have been taken into custody at Albany, most or all of them Knights of Labor and former employes, but no definite proof of guilt is yet published. In the absence of proof there is, of course, no telling whether the perpetrators of these outrageous crimes are discharged employes (Knights of Labor) or not; but it is needless to say that the strikers get the credit of the crimes, and that the behavior of many individuals is such as to tend to justify such a view. Train wrecking is not new, as our readers know. Every week the press dispatches report something of the kind. A few months ago three trainmen were killed in a horrible wreck of an oil train from a blocked switch in Indiana, which was accompanied by a big fire. The same paper that reports the Castleton wreck tells of a bad derailment of a passenger train, near Vicksburg, Miss., which was the result of deliberate malice. Some of the reported attempts at wrecking are only tricks of rascals to get rewards, and at the present writing one of the New York Central instances seems to be of that sort. A similar case has just happened at Boston; and yet actual malicious wrecking is common and apparently increasing. More cases occur in the sparsely settled regions of the South and West than in the East, but in general there is nothing new to be said concerning the lessons to be learned or the action to be taken. It is perhaps well, however, to call to mind the fact that the cure of this sort of devilry rests wholly with the public. A railroad company can itself provide reasonable protection against washouts and landslides by putting on a sufficient number of patrolmen, and it can look out for all the ordinary vicissitudes of train running, except the contingency of an unavoidable derailment on double track which obstructs an adjoining main track at the moment a train is approaching; but the devil who deliberately aims to wreck a train in the darkness of night has things practically all his own way. It is familiar knowledge that the most numer-

ous city police force can only with difficulty prevent housebreaking, and that crimes of this sort are committed almost under the noses of the police in spite of the best practicable means of prevention. A railroad line through an unsettled country is a hundredfold harder to guard. The New York Central might line its tracks with guards to an extent sufficient to increase its pay-roll 50 per cent., and yet it would be comparatively easy for a villain to find an unguarded space large enough to get at the track, put on a ten-pound obstruction, and murder a score of passengers. The whole community, therefore, is as vitally interested in the detection and punishment of this class of crimes as any railroad company can possibly be.

The Tests of the Baldwin Compound.

Interesting information, which has been much desired by locomotive men regarding the Baldwin four-cylinder compound locomotive, has just been made public in pamphlet form. Abstracts are given in another column. These tests were made to determine the comparative efficiencies of two locomotive engines of the eight-wheel type weighing about 36 tons, one of which was a 19 × 24-in. simple engine, the other a 12 and 20 × 24-in. four-cylinder compound, the high pressure cylinders being placed above the low-pressure after the manner of the Vaucrain patent. The comparative tests were made on the Washington limited express from Philadelphia to Washington and return, a total distance of 266 miles. Four trips were made with each engine. Tests were also made of the compound alone on an accommodation train from Philadelphia to Baltimore, 96 miles, and on a return express from Baltimore to Philadelphia, the same distance. Our readers will be most interested in the comparative tests, as they are the only ones which give any idea of the comparative economy.

The tests consisted in measuring the coal consumed in 24 hours, although the total working time was but six hours, and included the coal used for banking the fires. The water measurements were made in such a way as to give the amount used during each trip, and separately the amount used at terminals. The vacuum in the smoke box was measured with a water gauge. The temperature of the smoke box was not satisfactorily obtained, the pyrometer not being sufficiently accurate. The moisture in the steam was measured by a Barrus calorimeter mounted 30 to 36 ins. from the steam pipe on a ½-in. pipe leading thereto, the steam being taken from the branch pipe by a tube projecting into it, and which was perforated by ¼-in. holes. The dryness of the steam was determined by temperature reading only.

The locomotives were fitted with separate exhaust nozzles ¾ in. in diameter, the same for both engines, and each had a brick arch. The valve motion of the compound was the ordinary link, driving a piston valve of novel design, according to the Vaucrain patent. The valve motion of the simple engine was of the ordinary type, the valve having ¼ of an inch outside lap and 5¼ in. travel. The steepest grade going to Washington was 76 ft. to the mile, returning 55 ft. These were the general conditions under which the tests were made. The particular features which would show whether the locomotives were comparable in every respect are interesting.

We find in this report that:

First. The average consumption of coal for four round trips between Philadelphia and Washington was 14.9 per cent. less in the compound engine than in the standard engine; and the consumption of steam per horse power per hour during the selected periods of the runs which have been analyzed was 5.5 per cent. less in the compound engine than in the standard. The increased saving of coal over that of steam appears to be due to the improved action of the exhaust blast upon the fire which the compound principle secures. These results were obtained under the severe conditions of service required in moving an express train at a rate of speed varying from fifty to sixty miles per hour.

This conclusion needs considerable explanation in addition to what is given in the report. Taken at its face value, only one decision could be reached regarding compound locomotives, which is that they are of no great advantage simply because they are compounded, but because of the superior draft obtained on the fires. Now, to the contrary and as a matter of fact, such conclusion is not in any way to be fairly obtained from the experiments, because the compound principle was not fairly represented; not because the principle of the design was incorrect, but for the reason that the details were not in a form to give even fairly good results in steam expansion. This appears directly from an examination of the indicator cards, and also from the third and fourth conclusions in the report. The report reads:

Third. The increase in the consumption of steam which accompanies an increase of speed in the compound en-

gine is due to loss produced by the greater frictional resistance which the steam encounters in passing through the various ports leading to and from the cylinders. This loss appears to be more serious in the compound engine, with its double system of cylinders, than in the standard engine, with its single cylinder; and the conclusion may at once be drawn that the compound engine, in its present shape, will secure a greater saving of fuel when used on heavy express trains running at medium speed, on accommodation trains, and on freight trains, than when used on fast express trains. The tests furnish ample reason to expect a saving of coal on freight trains, and on accommodation passenger trains making frequent stops, of not less than 30 per cent.

Fourth. In the construction of future engines, improvements in the form, size or arrangement of the passages which conduct the steam from one cylinder to the other may doubtless be effected, which will reduce the frictional loss noted and increase the economy beyond that now obtained. With the same end in view, the use of a larger driving-wheel, with a proportionate increase in the stroke of the piston, thereby reducing the number of revolutions without changing the speed of the train, would be advantageous. Still another improvement may be made by reducing the size of the high-pressure cylinder to 11 in., and carrying a longer cut-off, the boiler pressure being increased at the same time, if found necessary, to 180 lbs. By this means a wider port-opening may be obtained without reducing the degree of expansion.

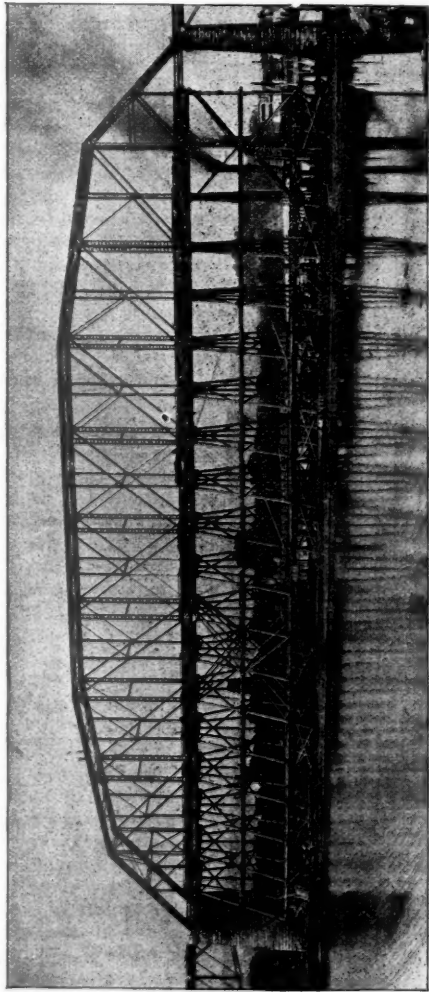
Without entering into further details, we believe that the results would have been decidedly more favorable to the compound locomotive if its construction had been such as to have given indicator diagrams from the high pressure cylinder as good as those from the simple locomotive. This will appear directly from an examination of the diagrams, Nos. 5 and 6, page 38, and Nos. 1 and 2, page 37, and 7 and 9, page 39.

It is stated that the saving at high speeds by the compound engine was 5.5 per cent., and also that on slow trains a saving may be expected of not less than 30 per cent. Here is a wide difference, and the explanation given in the report of the causes of this difference is correct. It is stated that they are due to the arrangement of the valve motion, causing greater frictional resistance, which the steam encounters in passing through the various ports leading to and from the cylinders; hence, we should not yet conclude that compound locomotives are much more economical than simple locomotives at high speeds when designed for such speeds.

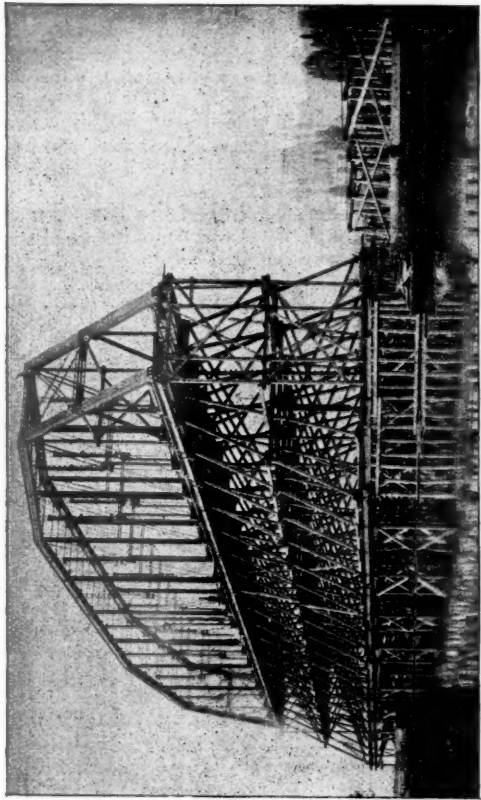
If it were true that the great advantage of the compound over the simple engine is to be found in the action of the exhaust on the fire, that is, in its greater uniformity, then the thing to do is not to adopt the compound engine, but to proceed at once to obtain better methods of blowing the fires. It appears from the report that the vacuum in the smoke box is 3.8 in. for the compound and 4.1 in. for the simple engine. This is a small difference in average intensity of blast to make the great difference shown in fuel consumption. This is further explained by stating that the exhaust from the simple engine is impulsive and tears the fire. Now, while this is to some extent shown by the difference in the terminal pressures on the indicator cards, yet the difference is not sufficient to give ground for a belief that there would be difference enough in effect on the fires to result in the difference in economy shown. If this small difference in average intensity or impulsiveness of blast will result in the wide difference in economy given in the report, then what enormous advantage awaits us when we produce a uniform blast with a blower located, for instance, on the foot plate.

After a careful examination of the report it appears to us that the main difference in economy must be looked for somewhere else than in the action of the blast. What we have all expected in the case of the compound locomotive was that there would be less steam used, and therefore there would be a decreased demand upon the fires which would result in more complete and uniform combustion, which would in turn give an additional saving to increase that obtained from the better expansion of the steam. In the cases in point, the water consumption in the average was but a trifle less in case of the compound, and if this water consumption is to be taken as directly proportional to the amount of direct steam used, then it is true, as stated in the report, that in these particular designs the steam economy of the compound was only 5.5 per cent. better than the simple engine.

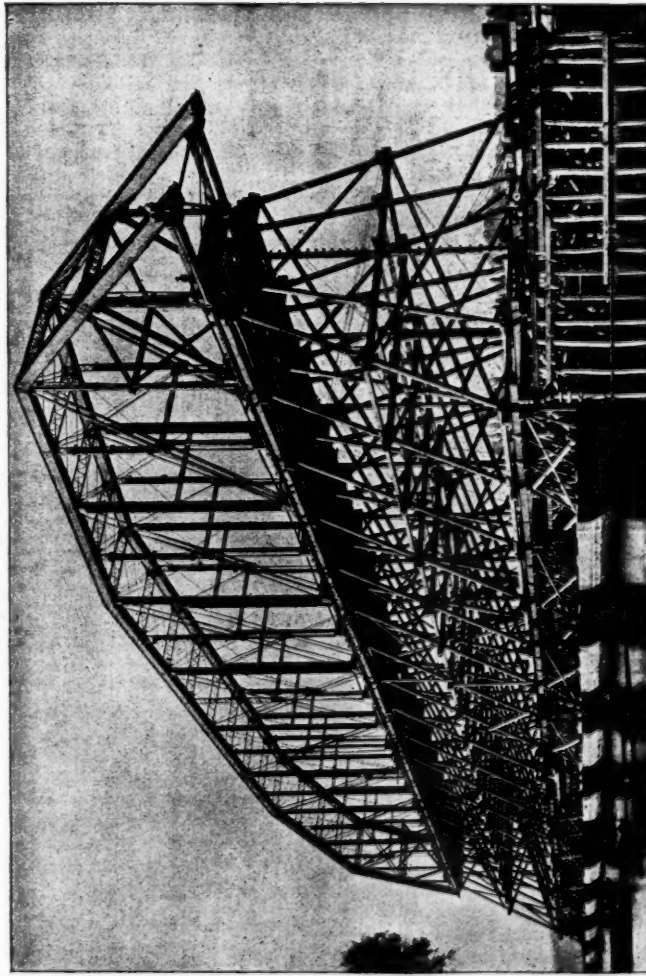
There are, however, several rather unsatisfactory conditions in connections with these tests which render the conclusions indecisive. For instance, it is stated that the engineers operated the throttles to suit themselves, and the calorimeter was not used in all of the experiments, and its arrangement on the locomotive was unsatisfactory. The wire drawing between the boiler and the steam pipe was 6 to 8 lbs. in the compound engine, and 15 lbs. in the simple engine. The boiler pressure in the compound averaged 148.6 lbs., while in the standard engine it was but 129.7. As we have before mentioned in these columns, much depends upon the condition of the steam in locomotive tests



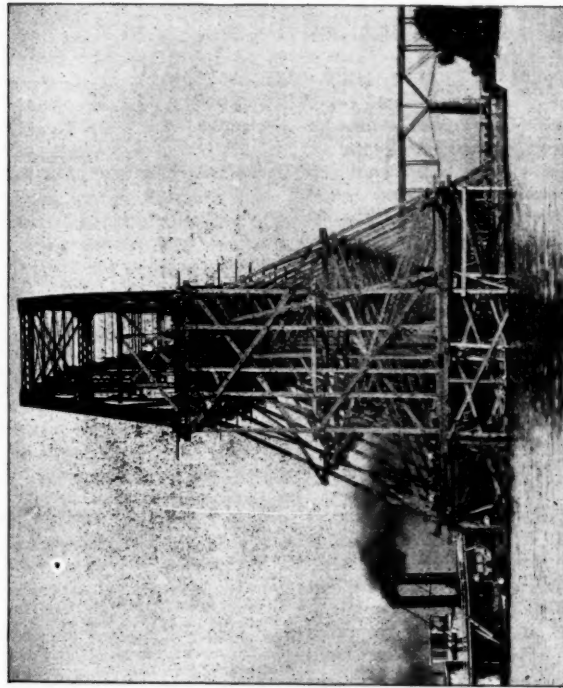
Span in Position.



Span on Staging where it was Erected.



Span Supported by and Floating on Barges.



End View with one Barge in Place.

FLOATING THE 523-FOOT SPAN OF THE OHIO CONNECTING RAILWAY BRIDGE, PITTSBURGH, PA.

KEYSTONE BRIDGE COMPANY, Builders.

C. L. STROBEL, Chief Engineer.



and it is absolutely essential that the exact amount of water which passes over with the steam as water shall be noted. In the case before us, the wire drawing was so great in the case of the simple engine that the steam might be expected to be fully dry, while in the case of the compound there may be some question as to the dryness.

It is to be regretted that these points were not more clearly determined, and the reasons therefor can only be understood by those who have ridden on the front of a locomotive during a test. The work of Mr. Barrus in this instance is highly commendable, as he was working under difficulties which we must not expect will be obviated until we have had more experience with accurate tests of locomotives. Evidently the locomotive was not under his control, as he states that the engineers operated the throttle to suit themselves, and the same conclusion can be drawn from other statements in the report. A locomotive test is not a simple matter, and the whole machine should be given over to the experimenter to do with as he thinks best, except, perhaps, it be in the matter of running time and speed, which, of course, in every instance, must be left to the Division Superintendent.

So far as these tests go, they show that the compound locomotive is considerably more economical at any speed than the simple engine; but it does not conclusively appear to what this increased economy is due. The report gives it as due to the better character of the blast, while an inspection of the indicator cards and the amount of vacuum in the smoke box in the two cases does not give sufficient ground for such conclusion; but the fact remains that the compound locomotive, under what we must insist upon as being conditions decidedly against it, has vindicated itself in this instance, and stands, even under these conditions, ahead of the simple engine for any class of service.

This is the third series of comparative tests made with compound and simple locomotives in this country recently, and in every case a decided saving has been shown in favor of the compound; but this is the first instance in which the economy has been attributed so largely to the action of the blast on the fire. Evidently there is no uniformity in the conclusions reached, and while it has been shown that compounding is an economical step to take, yet the true source of the saving therefrom is not yet demonstrated.

Difficulties in Testing Locomotives.

It may be interesting to show that a mere average of the results obtained, such as is given in Mr. Barrus' report, is not always satisfactory, and why it is unsatisfactory in this case. For instance, four runs were made with each engine under conditions as far as stated in the report—that is, with respect to the work to be done, weight of train, etc.—which are identical; yet on some days, notably May 7, the simple engine was more economical in water used while running than the compound on May 3, the difference being about 2 per cent. On May 7 also, the simple engine worked with almost identical economy with the compound on May 1. This is with respect to water consumption, and is given in the report as indicating the dry steam used. The simple engine used 8 per cent. more fuel on May 6 than on May 7 doing the same work; at least, in the report no account is taken of any difference in work, if there was any. Selecting three of the most uniform results from the compound and the three most uniform results with the simple engine, we find that the saving of fuel in favor of the compound is 12½ per cent. instead of 14 per cent. as given in the report; but this still leaves a decided advantage in favor of the compound, and while it would be more satisfactory if a larger number of tests had been made to determine the fuel used, yet it is evident that in spite of the wide variation of economy of each individual engine as shown by the 8 per cent. difference in the amount of coal used with the same engine under the same conditions on different days, there yet remains a balance in favor of the compound.

The amounts of water used in both cases are too nearly alike to render the average of this small number of tests decisive, the variation between the amounts used on different days with the same engine being greater than the difference between the average used in the case of the two engines. Therefore, while there is an indication that the compound used 5.5 per cent. less water, yet a larger number of tests might have shown a decidedly different amount.

A feature of these tests which should not be forgotten is that the schedule time was three hours, and during that time the throttle was closed thirty-one minutes going and forty minutes returning, leaving two and a half hours during which the throttle was

open while going to Washington and two hours and twenty minutes while returning from Washington, a total of four hours and fifty minutes during which the throttle was open. The coal, however, is given as that consumed during the whole twenty-four hours. While it may seem to the casual observer that there are many uncertainties in these tests, such as the rough measurements of the amount of water used for blowing out the cinders from the smoke box, blowing the fires and wetting down the coal, and that wasted to prevent the safety valves from blowing off, yet it will be found on examination that some correction has been made for this, and in a degree that makes the results, as far as these matters go, fairly comparable. The most uncertain element is probably the amount of steam used for the air-pump and the leakage around the piston rod packing and the cover of the valve chamber in the compound engine.

It seems from the report, page 32, that a 3½ in. nozzle on the simple engine was too large to keep up a satisfactory supply of steam, and it is intimated that this was the cause of the reduced boiler pressure on this engine; yet we are also told that the action of the blast of this locomotive on the fire was too great to permit equally good combustion with the compound. Now, while these statements are perhaps not contradictory, yet they need further explanation at the hands of the experimenter, and in this connection particular attention is called to the following quotation from page 33 of the report:

Making a comparison between the record of the cards for the tests of May 3 and 8, the first thing which is noticeable is the difference in the initial pressure in the high-pressure cylinder of the compound engine, and that shown in the cylinders of the standard engine. A second noteworthy difference is seen in the proportion of the stroke completed at cut-off on the high-pressure cylinder of the compound engine, as compared with that of the standard engine. Whether the standard engine would have shown a better performance with a higher initial pressure, or whether the compound engine would have shown a different performance with a different adjustment of the point of cut-off, and, furthermore, whether the conditions in general, which control the performance of the individual engines, were such as to secure a fair comparison between the two, are matters of conjecture upon which the data of the tests throw little light, and it is needless, perhaps, to discuss the effect which changes of condition might have had. In this comparison, however, of the results of the computations of steam accounted for by the diagrams, the fact stands out very plainly that at the point where the steam is about to be released from the cylinders, the quantity of steam consumed by the engine, figured from the diagram, is about the same in one engine as in the other; and under these circumstances the quantity of steam actually consumed could not be expected to differ much in one case from that in the other.

The disadvantage under which the compound locomotive was operating in this case, and which should show to us all that these results are not to be taken as indicating the comparative economy of the compound at high speeds under comparable conditions, is clearly pointed out by the experimenter in the following quotation from the same page:

The analysis of diagrams for the accommodation trip of June 2, in which the conditions are different from those in the other tests only in the matter of speed, shows, in a measure, the reasons for the improved performance of the compound engine under these favorable conditions. With about the same release pressure in both cases, a much larger amount of work is done in the case of the diagrams taken at slow speed than in the other case. The mean effective pressure, measured from diagrams on the accommodation run, is about 58 lbs. per sq. in. for the high-pressure cylinder and about 24 lbs. for the low-pressure cylinder, while on the express run the mean effective pressure is about 44 lbs. for the high-pressure cylinder and about 19 lbs. for the low-pressure cylinder.

The remedy proposed by Mr. Barrus is as follows:

The loss produced by the increase of speed is due to the wire-drawing of the steam in its passage from the high-pressure cylinder, through the valve, and through the low-pressure cylinder. It appears to the writer that improvements can be made in the size and arrangement of the passages, which will secure better performance, and that such improvements should be undertaken.

It is stated, on page 44 of the report:

It will certainly not be over-estimating the case if the expected saving of the compound engine at slow speeds is placed at 30 per cent. of the coal.

Now, if this is a firm conviction in the minds of the builders of the compound locomotive in question, and of the experimenter, then they should follow the investigations further and settle the matter beyond dispute; because if the Baldwin works can show that its compound locomotives will save 30 per cent. of the fuel used by simple locomotives, as it would appear from these experiments, then their engines would rank ahead of all recent locomotives, and the cost of the experiments would be *nil* compared to the advantages obtained.

Raise Wages 50 Per Cent!

The above exclamation is not intended as advice to a superintendent who is negotiating with the "Brotherhood of Railway Switchmen," nor to those dealing with the "Steam Railroad Men's Union," the United Order of Tie-Tampers, the Grand Combination of Fed-

erated Office Holders or any other body of railroad employes or ex-employes. There is much wisdom in the theory of stopping fights before they begin, of meeting just demands before they are made and thus laying the foundation for a firm resistance to those which are in the least degree unjust, and many managers would do well to consider an increase of pay rolls just on that basis; but we are not now speaking of that.

We refer to a class less numerous than those mentioned, but one equally or more important—the Division Superintendents. The division superintendent is one of the most important men on a railroad, and yet, as a rule, the office is not only one of the poorest paid, but in one sense one of the poorest filled. It is poorly filled in that where there ought to be ten such officers there are generally only five (or less), and also in that when an incumbent has qualified himself by experience to perform his duties well, sufficient effort is not put forth to keep him, if he makes up his mind to resign. This latter may be looked at simply as a question of salary. We have preached on this text before (though this is not the same old sermon, if it is vacation time), but expressions made by well-posted managers give evidence that it is one on which exhortation is still needed. An old general manager, and one of the most successful, remarked the other day that a road with an angel for president would fail to satisfy its patrons if the division superintendents were bad. He might have extended the scope of the statement, and could have truthfully said that with all of the general officers of the highest qualification the management would still be at a disadvantage in dealing with the public and with the employes unless the local representatives, the division superintendents, were the right sort of men to conduct those dealings.

A division superintendent should be a man of marked ability and long experience, because he must in many transactions not only command a division but must represent the whole road or system. With the general officer a thousand or even a hundred miles away, the most satisfactory conduct of business requires that he have plenipotentiary power in many respects. He is also important in a specific financial sense, regardless of his dealings with men. He first gives form to appropriation bills, more than perhaps any other officer, especially to those items of expenditure which are debatable and whose amounts are most subject to discussion and alteration. Bills for coal, rails, engines and cars are in a sense fixed charges, and the wisest officer can vary them comparatively little; but pay rolls, miscellaneous repairs, plans for curtailing work, for meeting unjust demands and the countless unclassified matters that all involve large expense need the very best talent, and the division superintendent's office is the place to put that talent. The plan of referring all knotty questions to the general superintendent or general manager works only with great friction at best, and it is, perhaps, not too much to say that the pleasantness and consequently the profitableness of the relations of railroads with their patrons and with their employes has steadily deteriorated under it; and the larger our railroad systems grow, the clumsier are the methods of dealing between officers and people. Railroad officers have to spend a very large share of their time in traveling, to achieve even moderate success. The advantages of consolidation have thus far, in some ways, overbalanced the loss occasioned by the great gulf that was fixed, by the consolidating process, between the managers and the people with whom they have to deal; but still the gulf needs bridging.

The title of this article is set there as a general proposition, not as a rigid rule for specific application. We do not advocate raising pay a single cent without at the same time getting more or better service, but the point that seems to be forgotten is that an officer of the class under consideration is constantly enhancing the value of his service. So much of his value to the company depends upon his acquaintance with his field, and his experience—not only in general railroadings as a profession, but—in dealing with his particular surroundings, that this is true not of brilliant and educated officers only, but of those of more moderate attainments as well. We may say, in passing, that there is no danger of demanding too high educational qualifications at the outset, and that though the Railroad College still languishes in the brains of theorists, we still insist on the necessity of training young officers for their duties, even at the expense of the company; but still, whether a superintendent is a college graduate and a man of scientific attainments, or is a bright young trainmaster who has been promoted for his good natural abilities, and has yet to learn how to dictate a hundred letters a day and make each one of them a model of diplomatic expression, it is equally true that experience is a prime

factor. A fairly qualified man's second year in this office is not only more valuable than the first, but is so in a marked degree; and this statement may be repeated each year for several succeeding years. A small increase, or a promise of more pay a year or two hence, is not sufficient in such a case; at least not so long as present standards prevail. Looked at as related to the cost of getting a new man to exactly fill his place, the resignation of a man from such a position as this is an increasingly serious loss up to the time he is equal to the general superintendent.

This brings us to the question of assistant officers. Theoretically, an officer has an assistant only when the multiplicity of duties becomes so great as to demand two men instead of one. Very few roads keep a man in any position, either partially or wholly for the avowed purpose of holding him for a superior's place when that shall be vacated. In a very true sense, however, the salary of an assistant-general superintendent may fairly be based in some degree on the potential value of the individual; the value of having a man ready trained for the general superintendency, if that office should suddenly become vacant. The same is true of division superintendents, their duties being very much like those of the general superintendent in all important characteristics; and where there is no assistant general superintendent a large percentage of these men's value should lie in this possibility. If it is not so it is fair to ask why, for a division superintendent who is unfit to take a similar office covering more miles is of questionable value where he is. In fact the apparent difficulty experienced by certain roads recently in filling general superintendencies satisfactorily was what inspired this article. A road which has a half dozen, or even a sixth of a dozen, division superintendents and does not regard any one of them as fit to take charge of the whole road is in bad shape, and the directors should find and apply a remedy. If the men are too young let the board inquire if stockholders' nephews have been given positions too freely. If they are good workers but poor masters of men, investigate the principles on which promotions have been made; perhaps the appointing power has been carelessly exercised. If these men are unfit for larger positions from lack of education, see what can be done about remedying the defect, and about educating train masters, dispatchers, and division engineers so as to provide against awkward dilemmas in the future. All of these points may be resolved into questions of expense, and we therefore come back to our starting point.

The last of the three queries may be met by the proposition to engage educated young men, as a few roads already do; but both the education of the schools and the experience gained on the road are needed, and it is a fair question whether at least a part of the officers could not better be made by giving scientific or general school training to young men who have grown up on the road, instead of expending a similar amount of money in giving experience to a man who has got his schooling before coming to the road. The former is in line with the popular American notion of picking up rough diamonds by the roadside and making gems of them, and in any event is the most practicable plan for many roads. A road in Texas might not succeed in getting the cream of the talent available in a graduating class at the Massachusetts Institute of Technology, and, if it did, might not be able to pay such an individual enough to keep him until his experience had made him worth something, for he would have other opportunities constantly tempting him; but it could make some headway in improving the capabilities of the young men it already has. A systematic course which should teach young men some of the things that they would learn in an old superintendent's office, but which should afford such stimulants that they could learn them more rapidly, would be a very passable substitute for the Railroad University, so far as our present purpose is concerned, and could be had in any locality where ordinary school teachers, with a bent for mechanical techniques, and the ability to inculcate a taste for reading and study, are available.

But as this subject leads in a dozen different directions, we must sum up without exploring the other eleven branches. We will translate our caption to read (instead of raising wages), Be prepared to expend one-half more, on the average, for keeping the division superintendent's office well filled. Some of the money should go to provide more dispatchers and trainmasters, so that men in those places who are already willing to improve themselves may have time to do so; some should go to pay for young division engineers who do not earn much for the company directly, but who must have opportunity to gain experience; some must go to hold good men who are now looking for

better places elsewhere, and some must be regarded as paying men to be ready for the general superintendency.

All this applies where the division is now of the right size; but we must go further, and consider the cases where the division superintendent cannot possibly perform all his duties properly even if he be perfectly qualified and work 24 hours a day. It is a plain fact, but one generally overlooked, that negotiations with dissatisfied employes or angry farmers whose cattle have been killed, careful scrutiny of several hundred or thousand pay-roll entries every month or week and keeping a constant watch upon the performances of engineers, operators, and trackmen, are things which a man cannot do in good shape unless he feels "fresh and rested." It is to be remembered, too, that the work of a division cannot be estimated by the number of men alone, any more than by the number of miles. Five hundred men who can very conveniently be dealt with by one superintendent when on 50 miles of road will demand much more of some one's time when they are scattered over 100 miles. If all these items foot up 75 or 100 per cent. increase, instead of only 50, it will not be surprising; but the change will nevertheless be found to pay.

Boston & Albany.

The report for the year (which now ends June 30) has been issued. Under the change in the New York law the year in that state has been made to conform to the Interstate and Massachusetts years. Hence, in the reported tables the figures for 1889 are for nine months only.

The principal figures are:

Earnings:	
Passengers	\$3,768,860
Freight	4,446,586
Miscellaneous	935,623
Total	\$9,151,069
Expenses:	
Maintenance way	\$989,720
Repairs engines	466,938
Repairs cars	751,849
Buildings, etc.	172,752
Transportation	3,722,862
General	172,607
Net income	\$2,874,291
Less Charges:	
Interest	\$468,842
Interest accrued	194,058
Dividends, 8 per cent.	1,630,000
Rentals	78,000
Surplus	\$533,391
Surplus, June 30, 1889	543,611
Less B. & A. stock bought of state of Massachusetts, and distributed to stockholders	1,044,405
Surplus June 30, 1890	\$32,595

Passenger and freight earnings show an increase of \$192,500. The number of passengers and passenger miles was larger than the previous year. The tons handled were also greater, but the ton-miles show a decrease of 20 millions, owing to a falling off in through tonnage. The average rate per ton per mile was 1.10 cents, as compared with 1.03 in 1889. This and the corresponding decrease in freight train mileage (the average load being about the same) left the results better than in the previous year. The average length of haul was 103 miles this year and 110 miles the year before. Whether this change in kind of traffic means that the Fitchburg is carrying more of the cheap freight, leaving to the Boston & Albany the better paying, or whether the change is common to all New England roads, cannot be told until all returns are in.

The improvement at Springfield (Union Station and change of grade) has been completed; all improvements at this point and elsewhere (except a part at Springfield) have been charged to operating expenses, as was also the cost of 11 locomotives, 330 freight and 12 passenger cars. Automatic electric block signals are to be erected on the whole line, from Boston to Springfield, 100 miles. A sale of a small piece of the Athol branch has been made to the New York & New England for \$33,000, and an exchange of land between the companies.

The balance to the credit of profit and loss, \$1,044,405, has been charged off. This item had been carried as representing the cost of the stock bought of the commonwealth and distributed to the stockholders in 1888. The company has petitioned the Legislature for permission to change the grade at 25 highway crossings, under the new law, wherein it is provided that the railroad shall pay 65 per cent. of the expense, the state about 25 per cent. and the town about 10 per cent. As the total expense to the state is limited to \$5,000,000, or not more than \$500,000 annually, it follows that but \$2,000,000 of money can be expended under this law throughout the commonwealth of which the railroad's share would be \$1,300,000. The Boston & Albany thinks its expenses under this head will require about \$500,000 of extra capital up to January, 1891. For these grade separations and to provide for the \$5,000,000 of seven per cent. bonds due in 1892, the directors recommend an issue of \$5,000,000 additional stock. How this is proposed to be sold and

on what terms is not stated, but no doubt stockholders will be allowed to subscribe for the new issue at par. The price of the present stock is now about \$223.

Any one very familiar with inventors in their relations to railroads has met the man with a coupler who burns with zeal to save the trainman from injury, but who knows nothing of the requirements that a car coupler must fill, or of what couplers other men have invented and made. But when the inventor's education has advanced so far that he knows that there is a Master Car Builders' Association, and a vertical plane coupler, and that the Association has adopted the vertical plane type as standard, one would suppose that he would also know that there are standard lines and dimensions to which a new coupler must conform. But he very often does not know this until he has spent time and money in elaborating a coupler that will couple with nothing else. This has been the case with several men who have lately come to this office for opinions as to the merits of their couplers. In each instance amazement on the part of the inventor followed an explanation of the facts regarding the standard contour, and the disappointed benefactor of railroad employes went home with a M. C. B. report under his arm to reconstruct his models. One busy superintendent of motive power has an effective way of treating inventors who apply for opinions and for permission to send samples for trial. He refuses to consider any device unless the inventor has posted himself thoroughly upon all that is given in the M. C. B. reports regarding the subject in question, and not then unless the device has been made to the requirements there laid down. One of the latest couplers that we have seen has no guard arm, and another is too wide to pass between the deadwoods.

E. E. Hill, Secretary of the National Association of Car Service Managers, has compiled a statement showing in condensed form the operations of 22 demurrage associations for May, June and July of this year. It appears that 1,220,350 cars were handled by the 22 associations in operation during the quarter, the average detention per car being one and one-half days. Statistics show the average detention of cars, before the associations went into operation, to have been over four days in the East and six to eight days in the West. Placing the general average at five days per car, which is no doubt a fair estimate, the different associations have reduced the general average detention 68 per cent. The smallest average detention for the three months is 1.07 days, at Grand Rapids, Mich. Cincinnati, which handled more than twice as many cars as Grand Rapids, reports 1.11 days. The highest average reported is that from Omaha, which is 3.31 days, but this report is for only one month—July. The Denver and Colorado associations (which are reported together) show 3.04 days' average detention for the quarter. The rate in this territory is only 50 cents a day, while in nearly or quite all other places it is \$1.00. This, doubtless, accounts for most of the discrepancy, though it may be that different degrees of strictness in enforcing the rules or in excluding from the account those cars which will tend to make an unfavorable showing may have something to do with it. As our readers know, Mr. Hill, who managed the pioneer Demurrage Association at Omaha in 1887, is at the head of the Colorado associations.

These persons who have not yet visited the Kinzua Viaduct, and who have been led by recent press dispatches to fear that they might never have the privilege of seeing the highest bridge in North America, may be reassured, as the report that this bridge was to be abandoned and torn down is wholly without foundation. The receipts from excursions of sightseers to this noted trestle have not "fully paid its cost," and if they had, it is by no means certain that its owners would deem that a good reason for turning it into scrap iron. The origin of the false rumor which the papers have given such wide circulation can hardly be accounted for, unless perhaps on the supposition that the New York Central strike gave out a few weeks too early, leaving the romancers out of work. The fact that the Buffalo, Rochester & Pittsburgh, whose trains now run over the Kinzua Viaduct, has been surveying for a detour around the valley may have been the first spark that fired the reporter's imagination. As the bridge was built only eight years ago, and was calculated for two consolidation locomotives coupled together, and as it is in as good condition now as when new, it would seem to be doubtful wisdom to use a detour line, even if one could be built for nothing.

The Nominating Committee of the American Society of Civil Engineers has sent out a circular to get the preferences of members for officers to be nominated for the coming year. We call particular attention to this circular. The year will probably be one of especial importance in the history of the Society. The revision of the constitution will probably be completed, and those who do not think the present organization and working machinery are what they ought to be are likely to have a good deal to say. If a majority of the members of the Society really wish a change in the methods of conducting its affairs the quickest way to begin is to get officers who are in sympathy with them, and it is easier to get

a ticket to suit them than to defeat the "regular" ticket. The Chairman of the Nominating Committee is Mr. Charles Paine, 820 Penn avenue, Pittsburgh; and suggestions for the ticket should be sent to him before Oct. 1.

NEW PUBLICATIONS.

Poor's Handbook of Investment Securities.—A supplement to Poor's Manual of Railroads. New York; H. V. & H. W. Poor, 1890. Price: paper, \$1.50; cloth, \$2.50.

The value of this book is indicated by the following synopsis of its contents. It is a work of reference almost indispensable to any one who has much occasion to study the finances and results of operation of railroads. It contains:

A table showing the range of stock and bond values at the leading stock exchanges of the country since Jan. 1, 1878; a statement of all dividends paid by the railroads of the United States during the past eight years; a list of bond-coupons payable each month in the year, with the places where the same are payable; a statement of the stocks and bonds listed on the New York Stock Exchange since Jan. 1, 1879; a statement showing for the leading railroad companies: (a) close of fiscal year; (b) time of holding annual meeting; (c) closing and opening of books; (d) place of holding annual meeting; a statement showing by cities the location of all railroad general and transfer offices.

The Rhode Island Technical Drawing School, at Providence, R. I., has issued its annual catalogue for 1890 and 1891, containing a description of the school and the facilities provided for the study of mechanical drawing and engineering. The attendance at this school has rapidly increased since it started, four years since, and the courses of instruction, including the visiting of shops, are very well arranged.

Illinois Society of Engineers and Surveyors. Fifth annual meeting, January, 1890. Price 50 cents. Secretary, S. A. Bullard, 208 South Sixth street, Springfield, Ill.

This volume contains the papers and topical discussions produced at the last annual meeting of this society. Several of them have been already printed, more or less condensed in the *Railroad Gazette*. Some of the papers of special interest to our readers are those on Sharp Curves, by Mr. E. A. Hill; Interlocking and Signaling, by Mr. Charles Hansel, Engineer to the Railroad and Warehouse Commission of Illinois; Cement Mortar, by Prof. I. O. Baker; Prevention of Abrasion of Creek and River Banks, by Mr. E. J. Chamberlain, and the Cairo Bridge and Terminal Facilities, by Mr. S. F. Balcom.

Mr. Hill's paper is much the longest and most elaborate, covering 30 pages. Mr. Hill establishes general formulae for the relations between the dimensions of cars and the radii of curves. He devotes himself particularly to the consideration of sharp curves in yards, and, besides the theoretical consideration, gives some space to actual examples of sharp curves used in practice. His general conclusions are that curves of at least 30 degrees can be used in passenger yards, and that where coupled freight cars are handled by engines in yards curves can be used with a radius as low as 90 or 100 ft., subject to occasional damage when trains are pushed over the curve; and, further, that a single freight car can run on any curve that a street car can, that is, up to 40 ft. radius. The paper closes with tables of dimensions of freight and passenger cars, taken from actual measurement, with the factors of his formulae computed for these dimensions. Altogether it is a contribution of a good deal of value to the literature of the subject.

Journal of the Association of Engineering Societies, July, 1890. This number of the journal contains papers on the Paris Exposition of 1889 by O. Chanute; Experience in the Construction of Gas Holder Tanks, by G. A. Hyde; Address of W. R. Warner, President of the Civil Engineering Club of Cleveland at the annual banquet; Filtration of Natural Waters, by Thomas M. Drown, and the Chicago Railway Problem, by Max E. Schmidt.

Substitution of Metal for Wood in Railroad Ties. A report to the Forestry Division of the United States Department of Agriculture. By E. E. Russell Trammann, C. E. Washington: Government Printing Office, 1890.

This is a volume of 334 pages, including a copious index and a list of patentees of metal tracks in the United States. It is a very exhaustive and comprehensive study of the whole subject, and apparently sums up the matter to date. The metal ties used in all the countries of the world are described and shown by illustrations. Statistical information is given as to cost and life of metal track. A list of 491 United States patents from 1839 to 1890 is appended.

Handy Lists of Technical Literature, being a Reference Catalogue of Books printed in English from 1880 to 1888, inclusive. Part III.: *Engineering and Mechanics*. Compiled by H. A. Haferkorn and Paul Heise. Milwaukee: Heise & Haferkorn, 1890. Price: paper, \$2.50; cloth, \$2.75.

Part I. of these lists covers useful arts in general, products and processes used in manufacture, etc. Part II. covers military and naval science, etc. Five more parts are now in preparation. The lists include books and pamphlets, giving the date of publication, price, and

some brief statement of the character of the work. A key is furnished also, giving the publishers. A select list of books printed before 1880 is also given, together with a supplementary list of periodicals and annuals. The lists are alphabetical and arranged by authors and subjects. The compilation is one of great convenience and value, and appears to be very well made; it is highly commended by those who have examined it thoroughly.

TRADE CATALOGUES.

Illustrated Catalogue of the Hall Signal Co., 50 Broadway, New York.—This is not only a beautiful catalogue, but it is an excellent treatise on automatic block signaling, electric interlocking and the protection by signals of switches, grade crossings, highway crossings, and other dangerous points. The fundamental principles are discussed at some length, and the instruments devised by the Hall Company, with their methods of operation, are very clearly and fully shown and described. The engravings are by Bartlett & Co., and are beautiful specimens of wood engraving of mechanical subjects. The text has evidently been prepared with care by some one who knows thoroughly well what he is writing about.

Catalogue of Steam Shovels and Excavators. Osgood Dredge Co., 37 State street, Albany, N. Y.

This catalogue describes very fully, with cuts, the standard steam shovels made by this well-known house. They have been so long and so widely used that there is no occasion to enter into any description of them here. The only novelty which we discover in this catalogue is the application of an electric motor to an Osgood No. 2 excavator. This machine was built for the Bennett Amalgamator Co., of Denver, and is operated in gold-bearing gravel beds. The complete plant includes a 100-horse-power dynamo, driven by water power, from which the current is carried about 1½ miles to the mines, where it operates a shovel, a conveyor, an amalgamator, two pumps and an electric light plant. The shovel is operated by one 25-horse-power standard motor and one 15-horse-power street car motor, both reversible. In addition there is a 25-horse-power motor to drive the conveyor and amalgamator. The conveyor is mounted on one side of the shovel, so that the shovel practically dumps on itself, and the amalgamator is coupled to the shovel and driven by link and belt machinery from one of the electric motors. In operation this application of electric power has been found very satisfactory. It is elastic, adjusts itself easily to the work doing, and does away with many of the annoyances inseparable from the use of steam.

How to Bore a Hole True, being Waterman's Book about Nicholson's Horizontal Borer. Published by Nicholson & Waterman Mfg. Co., Providence, R. I.

The pamphlet is very small but entertaining, and illustrates a fine tool. The preface is as follows: "This book is divided into Part I., which treats of boring and describes the machine, and Part II., which attempts to illustrate some operations which can be done to advantage; likewise other operations, of which it is safe only to say they can be done." Who ever reads the pamphlet will not waste much time and will probably get some ideas.

TECHNICAL.

Manufacturing and Business.

The Luttgens variable exhaust damper for locomotive smokestacks has been successfully used during the past two years on some Southern roads, running through the cotton districts, as a spark arrester and protection from fires. On one road, during the seasons when the cotton was exposed at stations, no fires have occurred since its adoption.

The Abendroth & Root Mfg. Co., 28 Cliff street, New York City, has received an order from the Edison Electric Light Company of Philadelphia for Root boilers aggregating 1,000 H. P. A large number of these boilers are already used in this electric light station.

The Safety Car Heating & Lighting Co. is equipping with the Pintsch light the cars of the Delaware, Lackawanna & Western, Boston & Albany, New York, New Haven & Hartford, Old Colony, Baltimore & Ohio, Central of Georgia, East Tennessee, Virginia & Georgia and many other Western and Northwestern roads.

The paper of the Worcester (Mass.) Steel Works has gone to protest in Boston, in consequence of the Potter-Lovell failure.

The Southern Malleable Iron Co. has been organized at Chattanooga, Tenn., to make malleable iron castings. P. A. Brawner, Jr., is one of the stockholders. Works will be erected near the Ross-Mehan foundry. The foundry building will be 70 x 165 ft., and contain two open hearth furnaces of C. H. Bauer's patent. The pattern and cleaning room is 70 x 120 ft. The works will be in operating condition Dec. 1. The process adopted is known as the C. H. Bauer annealing process, and is the same as is used by the Champion Mower and Reaper Works, of Springfield, O.

Iron and Steel.

At a meeting of the Henderson Steel Co. at Birmingham, Ala., recently, the former board of directors and officers were re-elected. The capital stock was increased from \$100,000 to \$200,000.

Ground was broken at McKeesport, Pa., last week for the foundations of the new iron mill projected by a company which has purchased the Allikanna (O.) Rolling Mill. The Allikanna mill machinery will be transferred to the new site. The new company will be known as the Boston Iron & Steel Co., and is composed of E. C. Converse, C. Chandon, T. B. Murray, Horace Crosby, Jos. Jackson and other officials of the National Tube Works Co. The mill will be run as one of the associate

branches of the National Tube Works. A steel plant will probably be added.

The Pennsylvania Rolled Steel Car Wheel Co. and the Continental Steel Co. have been merged into the Norristown Steel Co. After the transfer had been made and by-laws adopted, an election was held which resulted in the selection of 15 directors of the old board of the Pennsylvania company, with the exception of Col. Theo. W. Bean, who was elected to the vice-presidency of the new corporation. The new board consists of Lewis Royer, Theo. W. Bean, S. M. Moore, J. M. Cranston, E. M. Daniels, Daniel E. Houpt, Wm. B. Rambo, Benjamin Thomas, Geo. W. Grady, Chas. C. Highley, E. S. Stahlnecker, Isaac W. Smith and B. F. Richardson. It is reported that ex-Treasurer Slingluff will be proceeded against by civil action.

The Rail Market.

Steel Rails.—The New York market is hard to diagnose, but quotations are about the same as last week, \$31. Pittsburgh market unchanged and mills well supplied with orders. At Chicago business is a little more active and quotations have advanced 50 cents to \$33.50.

Old Rails.—500 tons have been sold at New York at \$25.25.

Rail Fastenings.—Spikes at New York, \$2.20 @ \$2.25. Bolts and nuts unchanged.

New Shops, Stations, etc.

It is said that the arrangements for building large shops at Fort Worth, Tex., for the Union Pacific system have been definitely agreed upon between the road and the local parties interested, and that work will be begun by Dec. 1.

The Minneapolis & St. Louis is to build a new brick machine shop at Cedar Lake, Minn., costing \$25,000, and the Great Northern will erect new round and storage houses at a cost of \$26,000.

The contract for erecting a building to be used for offices by the New York & Long Branch Railroad has been awarded to Robert Tappin. The building will be 50 x 80 ft. The first two stories are to be of Trenton front brick and gray stone, and the third story is to be frame.

The shops which the Columbus, Shawnee & Hocking has been building at Columbus, O., will soon be put in operation. About 25 men will be employed at first, and the force will be increased as occasion demands. In addition to the machine shop, car shop, paint shop and carpenter shop, the company has erected a round-house, sand-house and coal station.

A new passenger station is to be erected at Tarrytown, N. Y., by the New York Central & Hudson River.

Power Transmission.

A rather extraordinary project for power distribution is, at present, under consideration in Saxony, Germany. It is proposed to establish near the city of Dresden an immense electric central station to furnish high tension currents for lighting and power to 168 small towns and villages in the territory circumscribed by the towns Meissen, Freiberg, Pirna, Schandau, Sebnitz and Radeberg.

The *Chronique Industrielle* notes, in a recent issue, an electric power transmission station near the town of Domène, France, which supplies about 200 H. P. to a paper factory some three miles distant. Water power is used to generate the current. Telephone communication provides for the transmission of orders and reports between the mill and power station.

Continuous Heating Illustrated.

The Consolidated Car Heating Co., of Albany, N. Y., have on exhibition in the Brewster Exchange, Grand Pacific Hotel, Chicago, working models in glass of their different methods of heating passenger cars by steam from the locomotive. These models are the finest that we have ever seen, and any one interested in car-heating would do well to visit the exhibit, as much can be learned regarding the subject in general from an inspection of the models, working as they are under steam pressure.

THE SCRAP HEAP.

Notes.

A premature blast of rock in the yards of the Northern Pacific Railroad in Spokane Falls, Washington, on Saturday evening last killed 18 men and injured a large number of others.

The Pyle electric locomotive headlight is being tried on the Columbus, Hocking Valley & Toledo. The cost of the light complete is said to be \$350.

There was a small strike of yardmen on the Chesapeake & Ohio at Memphis last week because of the refusal of the road to reinstate a discharged foreman. The strikers made considerable show of strength, but soon gave in. There was a similar strike on the Toledo, Columbus & Cincinnati at Findlay, O., Sept. 8, impeding freight traffic somewhat. The strikers spiked a switch. There was a small strike on the Pittsburgh, Shenango & Lake Erie at Greenville, Pa., last week, which seems to have amounted to little. The yardmen and some freight train men of the St. Louis, Arkansas & Texas at Corsicana, Tex., struck on Thursday of last week, and caused considerable delay of freight trains. This road is in the hands of a receiver, and a United States District Judge ordered the marshal to take vigorous steps to prevent interference of trains by strikers, and the road, under protection of the officers of the law, succeeded in getting new men and moving trains. The strikers then surrendered. The strike of the employes of the Westinghouse works in Pittsburgh ended on Sept. 3, the men yielding and going back to work. About 1,200 men were affected.

The Southern Pacific expressed a willingness to adjust the wages of trainmen as demanded by a grievance committee which called on Superintendent Fillmore, but the company insisted that the committee should first be empowered by the employes to act decisively in their behalf. The conductors on one division had notified the superintendent that the committee did not represent them.

Notes on the Central of Georgia.

All the passenger engines of the Central are to be equipped with standard Pennsylvania whistles. The difference in sound will readily be distinguished from a freight whistle, the former being 13 in. long, the latter five. The road has recently received 25 new engines—three for the yards, four passenger and nineteen freight. A number of 16-in. light engines will be overhauled and fitted with modern improvements, for work on the branch lines. The Central has added to its army

of employes an experienced landscape gardener from Edinburgh, Scotland, who will lay off and establish parks at the stations at Fort Valley, Smithville, Albany, Cuthbert, Eufaula and Union Springs.

Machine Shops Burned.

The machine shops of the Denver & Rio Grande at Pueblo, Colo., together with ten cars, were burned Sept. 1. The loss will be about \$18,000. Owing to the Labor Day celebration, no one was at work, and the fire is supposed to have been caused by spontaneous combustion in a quantity of waste in the paint shop.

The French Telegraph System.

Referring to the recent international telegraph conference at Paris, *Le Figaro* gives an account of the development of the French telegraph system since the last international conference held at Berlin, Germany, in 1885.

In that year the total number of telegrams sent in the French Republic figured up 44,000,000. In 1889 it amounted to 55,000,000, showing an increase of about 25 per cent. in the four years. The percentage of increase in the number of telegrams sent to and from points outside of France is still greater, closely approximating to 40 per cent. For press dispatches a reduction in price of 50 per cent. has been effected. In the matter of cable service it is of interest to note that the control of the cable between France and England has passed into the hands of the government. The "Compagnie des Télégraphes de Paris à New York," further has severed its connections with other companies, so that it now has its own independent cable to the United States. A new company known as the "Société des Télégraphes Sousmarins" has been formed, and has commenced and partly completed cable lines to Venezuela, Curaçao, San Domingo, Hayti and Cuba, as well as to the French colonies Martinique and Guadeloupe.

In the matter of telephone communication the period from 1885 to 1890 marks the opening of the line between Paris and Brussels, and the completion of the 500-mile line between Paris and Marseilles.

Tracing Paper.

The Austrian hydrographic bureau adopts the following method of making paper transparent for copying drawings. The sheet of paper being placed over the drawing to be copied, it is lightly rubbed with a ball of cotton saturated with pure benzine. The tracing can then be readily made, owing to the resulting transparency, and the benzine, on evaporating, leaves the paper opaque as before, and without any trace of odor. Absolute purity of the benzine, however, must be insisted upon to secure good results.

Tit for Tat.

The city officials of Jersey City with a gang of 75 men uddid the work last night that had been done by the New Jersey Central Railroad forces Saturday night and Sunday before the police stopped them. The Lafayette Railroad Co., which is controlled by the Central, undertook to build a spur to the Griffing Iron Works, but neglected to procure the consent of the city authorities to cross the streets. After midnight Saturday a large gang of men laid the tracks across Van Horn and Woodward streets, but the police stopped the work before it was finished. The city's men were not accustomed to the work of tearing up tracks, but in about an hour and a half the tracks and ties at the Van Horn street crossing had been torn up and thrown down the embankment. The party then proceeded to Woodward street and repeated the process. A large contingent of policemen were on hand to protect the workmen.—*New York Tribune*, Sept. 9.

Lightning at Altoona.

At noon, Sept. 8, lightning struck the large block at Altoona, Pa., in which are the offices of the Pennsylvania Railroad. The building was soon ablaze, and great damage was done by both fire and water. All of the several hundred clerks employed in the building were saved, but there were several narrow escapes from suffocation. The lightning entered the telegraph room, in which were stored tons of paper, and the fire, communicating with this, gained great headway. The bolt of lightning which caused the fire descended from an almost clear sky, entering the building by means of the telegraph wires. Some of the old records were destroyed.

The Queen's English.

Under the above title the *New York Weekly* thus displays its literary ingenuity:

Englishman: "I say, ye know, what's the bookage to Boston?" Railroad Ticket Clerk: "The whatage?" Englishman: "The bookage, ye know—the tariff. What's the tariff?" Ticket Clerk: "I haven't time to talk politics."

Overturning Civilization.

The latest kink in railroad affairs is the strict attention the companies are paying to the habits of the men when off duty. Forbidding the use of liquor when on duty was the first step towards reform. This was followed by a prohibition of drinking at all, and then a bar was put on profanity. The latest, however, is a prohibition of the festive game of poker by the Louisville & Nashville, several employes of that road having been discharged for gambling among themselves. Kentucky and Tennessee are noted for poker playing and good whisky, and for the great road of the two states to shut down on both is going back on the two old commonwealths in a way that looks a little strange. How would it do for railroad presidents and other big officials to be fired for gambling in railroad stocks?—*Fort Worth Gazette*.

A Rise in Natural Gas.

A dispatch from Pittsburgh, Pa., says that two of the largest gas wells ever developed in that district have been found. One of the wells is located near Belle Vernon and is owned by the Philadelphia Co. The other is the property of the Bridgewater Gas Co., and is in the Wildwood Field. When the wells were brought in they blew out the casings. It is estimated that both are good for 800 lbs. rock pressure, and that the gas from these wells would be sufficient to run half the mills in the city.

The Stock Yards Switching Association.

The Railway Switching Association, which was dissolved on account of the switchmen's strike, is to be reorganized. The return to the old system resulted in the same vexatious delays, trains often being obliged to wait for hours until the one ahead had completed its work. Not only were the railroad companies dissatisfied, but the packing houses were put to great inconvenience.

LOCOMOTIVE BUILDING.

The Toledo & Ohio Central has received five new locomotives from the Brooks Locomotive Works.

The Columbus, Hocking Valley & Toledo has contracted with the Brooks Locomotive Works for five 53-ton mogul freight engines to be delivered in December.

CAR BUILDING.

The Mount Vernon Car Manufacturing Co., of Mount Vernon, Ill., announces that it is ready to manufacture freight cars of all kinds, including caboose and refrigerator cars. The capacity of the plant is now about fifteen cars a day.

We noted last week that the Louisville, New Albany & Chicago had announced through train service between Chicago and Louisville via North Vernon, Ind. It is now reported that the company has ordered from the Pullman Company three complete vestibule trains for these runs.

The New York & New England is building six freight cabooses at the Norwood Central shops.

Five new box cars made at the Columbia & Puget Sound shops at Seattle, Wash., were delivered to the Seattle & Northern last week.

The Grand Trunk has just received five new Pullman cars to run between Chicago and Boston. They are lighted by the Pintsch gas system. Each car is upholstered in blue and gold, and contains a library of two hundred volumes.

The Baltimore & Ohio is equipping a car with the Pancoast system of ventilation and appliances at its Mount Clare shops, Baltimore.

The Ohio Falls Car Works has been awarded the contract for building 50 box cars for the Richmond, Nicholasville, Irvine & Beattyville.

BRIDGE BUILDING.

Antrim, N. H.—An iron bridge to connect this town and West Deering, N. H., has been contracted for, to be in place by Sept. 25, the cost to be shared between the towns.

Auburn, Me.—The following bids were received Sept. 1 for an iron viaduct 300 ft. long, with 24-ft. roadway and two 5-ft. sidewalks: Dean & Westbrook, New York, \$6,345; Groton Bridge Co., Groton, N. Y., \$6,650; Pittsburgh Bridge Co., Pittsburgh, Pa., \$7,450; Berlin Iron Bridge Co., East Berlin, Conn., \$7,500. The contract was awarded to Dean & Westbrook.

Baiting Hollow, L. I.—The Long Island Railroad is building an iron bridge at Baiting Hollow.

Boston, Mass.—Alexander McInnis, Winthrop, Mass., has been awarded the contract for the River street bridge to Cambridge for \$12,500.

Cedartown, Ga.—The Queen City Bridge Co., of Cincinnati, O., has been awarded the contract for building an iron truss bridge across Taylor's Creek at this place.

Dallas, Tex.—Bids will be received by City Engineer D. A. Poyner for the construction of two iron bridges across Turtle Creek, one on Lemmon Avenue, one on Peak Street.

Derby, Conn.—The county commissioners of New Haven and Fairfield counties, Connecticut, will shortly ask bids for a bridge over the Housatonic River between the towns of Derby and Huntington. They expect to spend about \$70,000.

Dublin, Ga.—John T. Duncan will receive bids until Oct. 20 for building an iron bridge across the Oconee River. It is to be 320 ft. long, and 18 ft. wide, with a draw which will give 80 ft. clear space for boats on each side. Each bidder must submit his own plans and must bid for the substructure and bridge complete. Contracts are also to be let for 700 ft. of wooden trestle approaches.

Marble Falls, Tenn.—The officers of the stock company recently organized to construct a bridge across the Colorado River are: S. E. Holland, President; A. Struve, Vice-President, and Wade Border, Secretary.

Minneapolis, Minn.—The contract was awarded to the Chicago Forge & Bolt Co. for the fourteen 52-in. iron plate girders to carry the tracks of the Great Western road on Fifteenth avenue.

Quannah, Tex.—It is announced that \$10,000 has been raised by the citizens of this place for building the bridge across the Red River, which will unite Hardeman and Green counties.

St. Charles, Mo.—The law has been passed providing for the erection of a pontoon bridge across the Missouri River at St. Charles.

Seattle, Wash.—A drawbridge has just been completed for the Seattle Terminal Railway & Elevator Co. at Seattle, Wash. Its dimensions are 150 ft. long, 14 ft. wide and 22 ft. high. It is constructed of wood and iron and in the centre is a tower 40 ft. high.

Various Projects.—The San Francisco Bridge Co. has been awarded the contract for building the bridges on the Seattle & Montana from Seattle to Fairhaven, Wash. There are four draw spans to be constructed, one at the Skagit, one at the Stillaguamish and two at the Snohomish, and 13 fixed spans of Howe truss. These bridges are expected to be completed by Jan. 1.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

The Supreme Court of Texas decides that the State statute imposing a penalty on a railroad company for refusing to deliver freight, upon the payment or tender of the charges shown in the bill of lading, is not unconstitutional, as a regulation of interstate commerce, though applied to freight shipped from a point without the state.

In Kansas the Supreme Court rules that a stockholder of a railroad company is not liable for the negligence of the officers, agents or employes of the company in the operation of its road.

In Alabama, the Supreme Court rules that where one railroad company acquires a majority of the stock of another corporation, and the two have substantially the same field of operation, so that the profits of one may be enhanced by a diminution of those of the other, or where there is a conflict of interest between the two in the matter of expenditures or in the division of earnings, the corporation owning the majority of stock, its agents and employes, and all other persons acting in its inter-

est, may be enjoined from voting its stock in the election of officers of the rival corporation, or from exercising the power a majority of stock confers in controlling and governing such corporation.

In West Virginia the Supreme Court decides that a railroad company chartered by a state cannot, without distinct legislative authority, by lease or any other contract or arrangement, turn over to another company its road, and the use of its franchises, and thereby exempt itself from responsibility for the conduct and management of the road.

In the Federal Court it is held that where a railroad is in the hands of receivers pending suits of foreclosure and settlement of the priority of liens, it is proper, on the application of a lienholder claiming priority, to extend the receivership, as to such claim, over the portion of the road on which the priority is claimed. The court has power, on consulting the receivers, and without notice to the mortgagees, to order the lease of another road which is found necessary to the profitable management of the mortgaged property. An order may be made on the receivers of a railroad for the payment of expenses incurred by a mortgagee in a suit of foreclosure, where the mortgage makes provision for such expenses. The mortgaged property being insufficient to pay the mortgages, an order cannot be made for allowance of counsel fees of the mortgagor, to be paid out of money in the hands of the receivers.

Carriage of Goods and Injuries to Property.

The Supreme Court of Iowa rules that the acceptance by a railroad company in Illinois of goods marked for transportation to a point beyond its terminus establishes *prima facie*, under the law of that state, a contract to transport such goods to their destination. While in Texas it is laid down by the Supreme Court that the mere fact that a railroad company receives goods marked for a place beyond its own line does not import an agreement to transport the goods to the destination named as a common carrier.

In South Carolina a quantity of merchandise was consigned prepaid to plaintiff at a station where he had previously been agent. When the train arrived at the station the conductor opened a car and told plaintiff that he had some freight for him. Plaintiff said he could not take it, as he was no longer agent, and it was taken to the next station, where it perished. The Supreme Court holds the railroad liable for its value.

In Iowa the Supreme Court rules that in an action against a carrier for damages to butter, caused by heat, an instruction that the jury might infer that the butter was in good condition when received by defendant from the fact that it was shipped in good condition in a refrigerator car to St. Louis (whence it was delivered to defendant by a connecting carrier) is proper.

The Texas Supreme Court decides that, under the state law imposing a penalty on a railroad company for refusing to deliver freight upon the payment or tender of the charges shown in the bill of lading, it is not necessary that the bill of lading shall be shown at the time to make the tender of the charges effectual, unless its production is demanded.

In Pennsylvania the Supreme Court holds that where a railroad has taken possession of land, and constructed a road thereon, under permission of the owner, but without acquiring title or a contract which it could enforce, the owner can maintain ejectment against the company, but it will be treated as an equitable proceeding, and judgment will be stayed to allow the company to proceed under the statute to condemn the land and ascertain the damages, which will be assessed as of the date of the entry.

In Iowa the Supreme Court rules that if a license is granted by a lot owner to a railroad company to lay and operate tracks on the street in front of his lots, and the tracks are in operation when the lots are sold, the purchaser is charged with notice of the license.

The Texas Supreme Court holds that the purchaser of a railroad at foreclosure sale, under a decree that the purchaser hold free from all liens and incumbrances, is not an innocent purchaser as against one whose land has been appropriated without condemnation or compensation.

Injuries to Passengers, Employees and Strangers.

The Supreme Court of Pennsylvania holds that a regulation requiring passengers who do not purchase their tickets at a ticket office to pay a uniform excess of 10 cents over the regular fare, which excess the passenger is entitled to have refunded on the presentation at any ticket office of a refunding check delivered to him by the conductor, is not in itself unreasonable or oppressive, or needlessly inconvenient to the traveler. A provision that the collection of the excess shall be omitted as to passengers getting on the trains at stations where there is no ticket office, or on trains where, on account of the excessive rush of business, it is impossible to issue refunding checks, does not make the regulation partial or unfair.

In Wisconsin the plaintiff, while looking for a seat on defendant's train, was injured by stumbling over some satchels in the aisle of the car. None of the employes of defendant were in the car at the time of the accident. The car was lighted. The Supreme Court rules that he cannot recover damages.

In New York a train stopped so short a time at a station that a passenger without bundles could scarcely get off before it started. A passenger incumbered with packages was found at the station to which he had bought a ticket mortally wounded by the cars. No one saw him get off. The Supreme Court holds that a jury could infer that the accident was caused by the sudden starting of the train.

In Mississippi the Supreme Court rules that where a train fails to stop at a flag station which is a passenger's destination, and he jumps from the train, receiving no injury, he cannot recover exemplary damages, but can recover nominal damages only.

The Texas Supreme Court holds that a railroad is liable to an inexperienced brakeman for injuries received while coupling foreign cars, the injury being caused by the unusual construction of the couplings, materially differing from those of its own cars, unless it has cautioned him against the danger.

In Texas in an action for injuries received by a brakeman while coupling a box car to a locomotive, it appeared that the locomotive was intended for use on passenger trains, and that it had a coupling apparatus known as a "goose-neck," which is useless on freight trains, and, according to plaintiff's evidence, very dangerous. Plaintiff, who had been in defendant's employ some months, testified that he had always worked with the usual freight train locomotives; that he did not know of the use on freight trains of locomotives having this appliance; that this particular locomotive was sent out of the roundhouse without warning; and that he undertook to couple it to the box car in the usual way,

when he received the injuries complained of. The Supreme Court holds that, though defendant's evidence showed that plaintiff had been notified of the goose-neck before he attempted to make the coupling, a finding by the jury that defendant was negligent in using the engine without warning plaintiff of the increased hazard arising from the goose-neck attachment would not be set aside.¹⁹

In Michigan the Supreme Court rules that where the train dispatcher of a railroad company has absolute control of the running of its trains, and is charged with the duty of directing their movements, he is not a fellow-servant of the employee in charge of the trains, who are bound to obey his directions.²⁰

In Pennsylvania the plaintiff's carriage was struck by a train while she was attempting to cross the track. She knew that a car was coming and was near, having heard bells, but could not see it until she turned her horse on the track; and she testified that she then thought there was time to cross. The car was moving at the usual rate on a down grade, and plaintiff's horse was moving at a slow walk. The Supreme Court holds the railroad not liable.²¹

In the Federal Court it is laid down that it is the duty of one about to cross a railroad track to select, if he can safely do so, such a point as will enable him to see along the track both ways; and the fact that cars are left in such a position as to obstruct the view of the track in one direction does not excuse him from looking in that direction. And it is the duty of those operating a train, when approaching a place where persons engaged in business upon the road are called upon to pass from one side of the track to the other, to give warning of its approach, though such place is not a public crossing, and persons thus passing in the discharge of their duties cannot be regarded merely as trespassers.²²

In Pennsylvania the Supreme Court rules that a person only ten years old, a trespasser on the right of way, who, to avoid some water lying between the tracks, steps onto the end of the ties, and, after taking about three steps, is run over by a moving car, cannot recover for the injuries sustained thereby.²³

- ¹ Gulf, C. & S. F. R. Co. v. Dwyer, 12 S. W. Rep., 1,001.
- ² A. T. & S. F. R. Co. v. Cochran, 23 Pac. Rep., 151.
- ³ M. & C. R. Co. v. Wood, 7 South Rep., 108.
- ⁴ Ricketts v. C. & O. Ry. Co., 10 S. E. Rep., 801.
- ⁵ Meronville Trust Co. v. M. K. & T. R. Co., 41 Fed. Rep., 8.
- ⁶ Beard v. St. L., A. & T. H. R. Co., 44 N. W. Rep., 803.
- ⁷ Hunter v. South Pac. R. Co., 13 S. W. Rep., 190.
- ⁸ Edwards v. C. & D. R. Co., 10 S. E. Rep., 822.
- ⁹ Beard v. Illinois Cent. R. Co., 41 N. W. Rep., 800.
- ¹⁰ Gulf, C. & S. F. R. Co. v. Dwyer, 12 S. W. Rep., 1,001.
- ¹¹ Pittsburgh, V. & C. R. Co. v. Oliver (Pa.), 19 Atl. Rep., 47.
- ¹² Merchants' Union Barb Wire Co. v. C. R. I. & P. R. Co., N. W. Rep., 900.
- ¹³ Rio Grande & E. P. Ry. Co. v. Ortiz, 12 S. W. Rep., 1129.
- ¹⁴ Reese v. Penn. R. Co., 19 Atl. Rep., 72.
- ¹⁵ Stinson v. M. L. S. & W. R. Co., 44 N. W. Rep., 748.
- ¹⁶ Flanagan v. N. Y. & N. H. R. Co., 8 N. Y. Supp., 744.
- ¹⁷ K. C. M. & B. R. Co. v. Fite, 13 S. W. Rep., 65.
- ¹⁸ Missouri Pac. Ry. Co. v. White, 13 S. W. Rep., 65.
- ¹⁹ Galveston, H. & S. A. Ry. Co. v. Garrett, 13 S. W. Rep., 62.
- ²⁰ Hunn v. Mich. Cent. R. Co., 41 N. W. Rep., 502.
- ²¹ Citizens R. Co. v. Thomas, 19 Atl. Rep., 286.
- ²² Owens v. Penn. R. Co., 41 Fed. Rep., 187.
- ²³ Mitchell v. Philadelphia, W. & B. R. Co. (Pa.), 19 Atl. R. p., 28.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Manhattan Elevated, quarterly, 1½ per cent., in script, payable Oct. 1.

West Jersey, semi-annual, 3½ per cent., payable Sept. 15.

West Jersey & Atlantic, semi-annual, 2 per cent., payable Sept. 15.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Albany & Susquehanna, annual, New York City, Sept. 17.

Baltimore Belt, Baltimore, Md., Sept. 15.

Baltimore & Ohio & Chicago, special, Deshler Block, Columbus, O., Sept. 26.

Boston & Albany, annual, 78 Tremont Street, Boston, Mass., Sept. 24.

Chicago, Milwaukee & St. Paul, annual, Milwaukee, Wis., Sept. 20.

Connecticut River, annual, Springfield, Mass., Sept. 17.

Delaware & North River, special, 10 Wall street, New York City, Sept. 23, to act upon a proposed consolidation with the Port Jervis, Monticello & New York.

Fitchburg, annual, Boston, Mass., Sept. 24.

Illinois Central, annual, Chicago, Ill., Oct. 8.

Knoxville Belt, special, 126 Gay street, Knoxville, Tenn., Nov. 1.

Knoxville, Cumberland Gap & Louisville, special, 126 Gay street, Knoxville, Tenn., Nov. 1.

Knoxville Southern, special, 126 Gay street, Knoxville, Tenn., Nov. 1.

Lake Erie & Western, annual, Bloomington, Ill., Oct. 1.

Maine Central, annual, Portland, Me., Sept. 17.

Minneapolis, St. Paul & Sault Ste. Marie, annual, Guaranty Loan Building, Minneapolis, Minn., Sept. 16.

Ohio & Mississippi, annual, Central Union Depot, Cincinnati, O., Oct. 9.

Old Colony, annual, Boston, Mass., Sept. 30.

Pittsburgh, Cincinnati, Chicago & St. Louis, special, Pittsburgh, Pa., Sept. 16.

Port Arthur, Duluth & Western, special, Port Arthur, Ont., Sept. 23.

St. Louis, Alton & Terre Haute, special, Laclede Building, St. Louis, Mo., Oct. 3, to consider the sale to the Cairo, Vincennes & Chicago.

St. Louis Merchants' Bridge Terminal, special, Laclede Building, St. Louis, Mo., Oct. 1, to vote upon a proposed increase of the capital stock.

St. Paul & Duluth, annual, St. Paul, Minn., Oct. 9.

West Virginia Central & Pittsburgh, special, Piedmont, W. Va., Sept. 29.

Railroad and Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Association of General Passenger & Ticket Agents* will hold its thirty-fifth semi-annual meeting at Denver, Col., Sept. 16.

The *American Society of Railroad Superintendents* will hold its annual meeting in New York City, Oct. 7.

The *General Time Convention* will hold its next semi-annual meeting at the Hotel Brunswick in New York City, Oct. 8.

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m. The Club has adjourned until Tuesday, Sept. 16.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwestern Railroad Club* meets on the first Saturday of each month in the St. Paul Union Station at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of each month at 7:30 p. m. in the directors' room of the St. Paul Union station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m. on the third Wednesday in each month. The next meeting will be held the third Wednesday in September.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1122 Girard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month at the Club rooms, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8:00 p. m. in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the Southwest* holds regular meetings on the second Thursday evening of each month at 8 o'clock, at the Association headquarters, Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings on the first Wednesday in each month at Wichita, Kan.

Northwestern Track and Bridge Association.

At the adjourned meeting to be held at the St. Paul Union Depot, Friday, Sept. 19, Mr. A. Amos, of the Minneapolis, St. Paul & Sault Ste. Marie, will read a paper on the "Best Method of Constructing Pile and Trestle Bridges."

South and Southwestern Railway Club.

The members of this club have decided by letter ballot that the first meeting shall be held in St. Louis, and it will accordingly be at the Southern Hotel, in that city, Sept. 25. At Old Point Comfort the officers of the club for the current year were elected, but a constitution and by-laws have not yet been adopted. It has therefore been decided to hold two sessions on Sept. 25, one in the morning at 10:30, at which the work of organization will be completed, and one in the afternoon at 2, which will be devoted to discussions.

All in the mechanical departments, including the locomotive and car departments, of the railroads of the South and Southwest, are invited to join the club.

The charter members are:

E. S. Marshall (President), Wm. Garstang (First Vice-President), J. J. Casey (Second Vice-President), W. H. Marshall (Secretary), A. J. Steinbrenner, W. P. Siddons, W. A. Stone, James McGee, John Hodge, M. T. Carson, W. T. Smith, F. P. Boatman, H. C. Bossinger, L. C. Noble, J. H. Agnew, James Meehan, Wm. Jennings, C. H. Howard, E. T. Silvius, E. Geffcher, W. H. Trainham, W. H. Day, James Bossinger, John H. Davis, D. W. Balentine. The Secretary's office is at the Rookery, Chicago.

Western Railway Club.

The club will hold its first meeting of the season of 1890-91, on Tuesday, Sept. 16, at 2 p. m., at its room 850 Rookery Building, Chicago.

Two unfinished subjects, "Relative cost of maintaining rigid centre and swing centre trucks of freight cars," and "What has been observed as to comparative flange wear of wheels," have been combined, and will be reported upon by a committee of three, Messrs. William Forsyth, C. A. Schroyer and P. H. Peck. Every one is cordially invited to attend.

PERSONAL.

—Joseph H. Welch, who was indicted for causing the death of Mary E. Fenley at Quincy in the Old Colony disaster, has been arrested on a capias and imprisoned in Dedham jail.

—H. P. Latta, Master Mechanic of the Toledo Division shops of the Lake Shore & Michigan Southern at Norwalk, O., has resigned to accept the position of Master Mechanic of the Chicago & Erie, with headquarters at Huntington, Ind., succeeding J. H. Berry.

—Hon. L. S. Coffin, of Iowa, is President of an organization which proposes to establish a combined hospital and educational institution at Chicago for railroad men. It is to be called the "Brotherhood of Railway Employees Home." Subscriptions from trainmen, engineers, etc., and from organizations composed of these men are to be relied upon for support.

—Mr. S. S. Eastwood, Secretary and Treasurer of the Henderson Bridge Co., and an officer of the Louisville & Nashville, has become insane and has been committed to an asylum, though the malady is not believed to be incurable. Mr. Eastwood's mental aberration is supposed to be the sequel of a severe typhoid fever which he had a few months ago.

—Mr. M. A. McDonald terminated his services as General Manager of the Pittsburgh & Western last Saturday. It is reported that the following heads of departments have also resigned: Master Mechanic John A. Quinn; Master Carbuilder Thomas Anderson; Superintendent of Construction J. B. Markley, and Division Superintendent H. C. Boughton.

—Mr. L. C. Higgins, Purchasing Agent of the Lake Shore & Michigan Southern, died at his home in Cleveland, Sept. 1, after a brief illness, due to the lingering effects of a troublesome case of blood poisoning. He was 42 years old, and universally esteemed as one of the most valued of the Lake Shore's officials. For a long period previous to 1884 he was President Newell's private secretary.

—Mr. George Berkley, the Senior Vice-President of the Institution of Civil Engineers (England), and by its statutes the next President, is about to visit the United States in company with the members of the Iron and Steel Institute. Mr. Berkley has belonged to this Institution for upwards of forty-five years, for more than thirty-six of which he has been a full member. After a pilgrimage under Mr. Jacob Samuda he was for many years actively associated with the late Robert Stephenson, the son of George Stephenson, on railroad and other engineering works, and on the death of Mr. Robert Stephenson he became consulting engineer in England of the Great Indian Peninsula Railway Company, a position he still retains. He is likewise consulting engineer for the Natal Government railroads and for the Argentine Northeastern Railway.

—Charles Rockwell, General Freight Agent of the New York, New Haven & Hartford, died at his home in Southport, Conn., Sept. 8, after an illness of three weeks. Mr. Rockwell was 71 years old, and had been connected with the company or its leased lines for the past 40 years. He first entered the employ of the old New York & New Haven in 1849 as agent in New York, when the company's offices were on Broadway, near Canal street, New York, where he wrote on common pasteboard the first passenger tickets sold by the company, signing with a pen his signature to each. For a while he acted as superintendent of the New Haven & Northampton, and about the year 1845, as purser on the steamboat "Nimrod," plying between New York and New Haven. He was a man of staunch integrity and unimpeachable character. He leaves a wife and daughters and two brothers.

ELECTIONS AND APPOINTMENTS.

Adirondack.—At a meeting of the stockholders held at 21 Cortland street, New York City, Sept. 10, the following directors were elected: R. Suydam Grant, James C. Hart, Frederick Billings, Horace G. Young, James Roosevelt, Charles A. Walker, Robert Oliphant, David Wilcox, Chester Griswold, William W. Durant, Warner Miller, Freling H. Smith and William L. Strong.

Atchison, Topeka & Santa Fe.—C. W. Kouns has been appointed Car Service Superintendent, vice A. P. Wilder.

Brooklyn & Brighton Beach.—At a meeting of the stockholders of the company at Brooklyn, N. Y., Sept. 9, directors were re-elected as follows: Wm. Marshall, A. S. Robbins, A. B. Baylis, U. A. Murdoch, George I. Murphy, General James Jourdan and Colonel E. L. Langford. The directors met and re-elected General Jourdan President, Colonel Langford Secretary and Treasurer, George I. Murphy Counsel and J. L. Morrow Superintendent.

California.—The incorporators of this road are: W. M. Rank, George E. De Golia, J. H. Bass, F. E. Fitzpatrick, T. F. Still, J. T. Ward and E. B. De Golia.

Canadian Pacific.—C. W. Milestone has been promoted from the position of Chief Train Dispatcher at Winnipeg, Man., to that of Assistant Superintendent, with headquarters at Moose Jaw, N. W. T., succeeding J. A. Cameron, resigned.

Cape Girardeau South Western.—Emil Sebastian has been appointed Roadmaster, vice J. W. Morse, resigned.

Chattanooga, Rome & Columbus.—W. W. Brookes has been elected Secretary, with office at Rome, Ga., vice R. T. Fouché.

Chesapeake & Ohio.—F. A. Molitor, Engineer of Maintenance of Way of the Cincinnati division, has resigned, and the jurisdiction of H. Pierce, Engineer of Maintenance of Way of the Huntington division, will be extended over that division.

All Maintenance of Way department offices have been removed from Hinton to Huntington.

The motive power department of the James River, Richmond and Peninsula divisions are now operated under the supervision of one Master Mechanic. T. S. Lloyd has been appointed to that position, with office at the Seventeenth street shops, Richmond, Va.

Chicago & Erie.—This company, the successor of the old Chicago & Atlantic, was permanently organized in New York Sept. 5. The new Board of Directors is composed of John King, J. G. McCullough, S. M. Felton, Jr., E. B. Thomas, Melancthon D. Woodford, J. H. Benedict, V. T. Malot, John Tod, H. H. Brown, J. C. Morse, G. W. Ristine, Samuel Spencer and Andrew Donaldson. The Board met afterward and elected J. G. McCullough President; S. M. Felton, Jr., Vice-President; Arthur Turnbull, Secretary, and Edward White, Treasurer.

Chicago, Rock Island & Pacific.—S. B. Hovey succeeds W. J. Lawrence as Superintendent of the Western division of this road, with headquarters at Colorado Springs.

Chicago, St. Paul & Kansas City.—At the annual meeting of the stockholders, held at Dubuque, Ia., Sept. 4, General Manager John M. Egan was elected President of the road on the recommendation of President Stickney, and the Board of Directors was increased from 7 to 15. The board now consists of A. B. Stickney, C. W. Benson, Wm. Dawson, Jr., A. Oppenheim, S. C. Stickney, J. M. Egan, F. B. Clarke and A. M. Drake, all of St. Paul; David Rankin, Tarkio, Mo.; A. Slemmer, Waverly, Ia.; Andrew Crawford, Chicago; John L. Pratt, Sycamore, Ill.; I. L. Elwood, DeKalb, Ill., and Col. F. D. Stout, Dubuque, Ia.

Columbus, Hocking Valley & Toledo.—A. E. Robbins has been appointed Superintendent of the Toledo division vice James Bruce, resigned.

East Broad Top.—J. E. Haverstick has been elected Secretary, vice W. B. Jacobs, with office at Rockhill Furnace, Pa.

Florida Midland.—G. H. Hepburn has been appointed General Freight and Passenger Agent, with headquarters at Kissimmee, Fla.

Fort Worth & Denver City.—W. A. Ross has been appointed Auditor.

Gainesville, Jefferson & Southern.—At the annual meeting of the stockholders the vacancies in the board of directors caused by the deaths of Messrs. K. L. Boone and D. R. Lyle were filled by the election of Messrs. John A. Smith and H. D. McDaniel. Otherwise the board remains unchanged.

Grand Tower & Carbondale.—J. D. Peters having resigned the office of Superintendent in order to devote his exclusive attention to the coal business of this company, F. H. Batcher has been appointed Superintendent.

Iowa Central.—The stockholders have elected the following officers for the coming year: Russell Sage, President; H. J. Morse, Vice-President; George R. Morse, Secretary and Treasurer; Russell Sage, H. J. Morse, A. B. Sweeney, G. E. Taintor, Edward E. Chase, Robert T. McFadden, Dunlap Smith, C. H. Ackert and George R. Morse, Directors.

Lake Shore & Michigan Southern.—Albert Bodine, of Elkhart, Ind., has been appointed Master Mechanic of the Toledo Division, with headquarters at Norwalk, in place of H. P. Latta, resigned.

Los Angeles Terminal.—The directors of this California road are: W. H. Workman, Daniel McFarland, R. C. Kerens, T. B. Burnett and B. F. Hobart.

Mexican Central.—H. B. Wilkins has been appointed Assistant General Freight and Passenger Agent.

Mexican Northern.—The officers of this company are: Robert S. Stone, President; A. R. Meyer, First Vice-President; Nathaniel Witherell, Second Vice-President; C. J. Nourse, Jr., Secretary, and A. Foster Higgins, Treasurer. The New York office is at 20 Nassau street, and the office in the City of Mexico is at Calle de Cadena, No. 10.

Michigan Central.—E. C. Brown having requested, on account of ill health, to be relieved from the duties of General Superintendent, has been appointed assistant to the President, with office at Detroit, Mich.; Robert Miller has been appointed General Superintendent, office Detroit; R. H. L. Hommedieu has been appointed Assistant General Superintendent, and will have immediate supervision of train and station service and the distribution of cars, office Detroit; J. H. Snyder is appointed Acting Superintendent of the West and Joliet Divisions, with office at Chicago.

Missouri Pacific.—Frank P. Wade, recently General Traveling Agent of the Wabash, has been made General Agent of the Missouri Pacific, with headquarters at St. Joseph, Mo.

Nashville, Chattanooga & St. Louis.—At the annual meeting in Nashville, Sept. 10, the stockholders re-elected these directors: J. W. Thomas, G. M. Zogg, W. W. Duncan, A. H. Robinson, G. A. Washington, L. H. Lanier, Jr., M. Burns, J. D. Probst, Ex. Norton, Thomas Lipscomb, E. L. Jordan, T. W. Evans, J. W. Sparks, J. H. Inman and J. G. Aydelott. The directors elected officers as follows: President and General Manager, J. W. Thomas; Secretary and Treasurer, J. H. Ambrose; Chief Engineer, R. C. Morris; Controller, J. D. Maney.

Natchez, Red River & Texas.—C. A. Gardner is General Superintendent, with office at Vidalia, La.

New Brunswick.—Robert Meighan has been elected President in place of Sir George Stephen. His office is at Montreal. H. P. Timmerman is the Superintendent in charge of the Fredericton Branch.

Norfolk & Virginia Beach.—At the annual meeting of the stockholders of the road, the following officers were elected: Charles W. Mackey, President; Warner Van Norden, Vice-President; Hon. James H. Hopkins, George R. Howell, Charles W. Mackey, J. W. Rowland, W. L. Stowe and William Evans, Jr., Directors.

Northern Central.—Charles A. Chipley has been appointed Assistant General Freight Agent, with office at Philadelphia, Pa., and A. W. Sumner, Assistant Purchasing Agent.

Northern Pacific.—Joseph McCabe, formerly Superintendent of the Minnesota division, has been made Superintendent of the Pacific division and branches of the Northern Pacific, vice A. L. Horner, to take effect Sept. 15.

Perry County.—James Elliott is Superintendent of this road, with office at New Bloomfield, Pa.

Providence & Stonington Steamship Co.—At a meeting in Providence, R. I., Sept. 10, the following officers were elected: President, J. W. Miller, New York; Vice-President, S. D. Babcock, New York; Secretary, Edward P. Taft, Providence; Treasurer, W. F. Herbert, New York. The directors are Samuel D. Babcock and George Maculloch Miller, New York; Edward P. Taft, John L. Riker, B. F. Vaughan, Henry Howard, Jacob Small, George G. Haven and Nathan E. Dixon.

St. Louis & San Francisco.—C. L. Brown has been appointed Engineer, vice James Dun. E. B. Sankey has been appointed Assistant Superintendent at Salem, Mo. The headquarters of J. R. Wentworth, Division Superintendent, have been removed from Wichita to Neodesha, Kan.

San Jose & Southern.—The officers of this California road are: President, J. H. Henry; Secretary, J. R. Patten; Treasurer, B. D. Murphy. The headquarters will be at San Jose.

Southern Pacific.—R. Stevenson has been appointed Purchasing Agent of the Pacific system, with office at San Francisco, Cal.

Toledo, Ann Arbor & North Michigan.—J. M. Ashley, Jr., has been elected First Vice-President, with office in New York City; A. W. Wright, Second Vice-President; H. W. Ashley, General Manager, and B. F. Jervis, Secretary.

Vincennes, Oakland City & Owensboro.—At the annual meeting of the stockholders at Vincennes, Ind., recently, the old board of directors were re-elected.

Wabash.—At the annual meeting of the stockholders at St. Louis, Mo., Sept. 9, the following Board of Directors was re-elected: O. D. Ashley, R. C. Reynolds, George J. Gould, Sidney Dillon, Edgar T. Welles, Thomas H. Hubbard, Henry K. McHarg, John T. Terry, C. J. Lawrence, James F. Joy, Russell Sage, James F. How and Charles M. Hayes.

RAILROAD CONSTRUCTION. Incorporations, Surveys, Etc.

Anniston & Atlantic.—Tracklaying has been commenced on the extension between Shelby and Calera, Ala. The grading has been finished between these places. All the work on this extension is rapidly nearing completion; and it is expected that trains will be running between Atalla and Calera via Anniston and Sylacauga by the middle of October.

Atlantic, Henderson & Virginia.—This road was recently incorporated in North Carolina to build a line from Henderson to Nash County. The citizens of Henderson have voted to issue \$40,000 in bonds to aid in the construction of the road. J. R. Young is President.

Baltimore Belt Line.—Contracts for the construction of this road were let in Baltimore Sept. 4. Sections one, two and four were awarded to Ryan & McDonald, and section three to McCabe Brothers. The first section is two miles long, and extends from Bay View Junction to the Belair road; the second section is 1½ miles long, and is from Belair road to Guilford avenue; the third section is 1½ miles, and is from Guilford avenue to a point near Mount Royal avenue; and the fourth section is from Mount Royal avenue to Hamburg street. Section three is required to be tunneled under Maryland avenue, Charles and Calvert streets, and section four includes the tunnel under Howard street. The covered way under Howard street consists of an arch of brick, resting upon side walls of brick or stone. This work is to be prosecuted in sections not exceeding 400 ft. in length in any two contiguous blocks at one time, and it is to be pushed day and night. The contracts do not include all the bridges which will be required for the road, nor the laying of the tracks. The length of the road will be a little over 7 miles, and arrangements are to be made for three stations, one, a central station, to be on or near Baltimore street, one at North avenue and Oak street, and one at a point between Charles street and St. Paul street. The bids of the successful contractors call for an outlay of \$3,000,000, and work will be begun at once. The Maryland Construction Company, of Baltimore, acts for the railroad company.

Baltimore & Ohio.—At a special meeting in Baltimore on Monday of this week the stockholders approved the contract between the company and the Baltimore Belt Line, as also the mortgage of the property of the latter road to the Mercantile Trust & Deposit Co. of Baltimore. As our readers know, the chief purpose of the Belt Line is to connect the Philadelphia Division of the Baltimore & Ohio with its main line and Washington branch. At the same meeting the directors approved the contract with the Akron & Chicago Junction road.

Birmingham, Sheffield & Tennessee River.—It is stated that the road will build a branch from Margeum, Ala., on the Memphis & Charleston, in Colbert County, to Darlington, a small town on the main line of this road, in Franklin County. The proposed road will be 40 miles long, and will open undeveloped country. It is said that it will be put under construction at an early date. On the extension, from the connection with the Georgia Pacific, 12 miles south of Jasper, to Bessemer the surveys are finished, and the management are now figuring on the cost of the new line.

California.—There have been filed in the office of the Secretary of State of California articles of incorporation of this road. The purpose is to build a standard gauge road from Alameda, Cal., to Park Place, in the same county, and thence east to Stockton, Cal. The capital stock is \$750,000, and the principal place of business Oakland, Cal. The directors are William Rank, George E. DeGolia, S. H. Bass, F. E. Fitzpatrick, Thomas T. Still, J. T. Ward and E. B. DeGolia.

The object seems to be to extend the Laundry Farm road from Laundry Farm, its present terminus, to Stockton. That road is now in operation from Fruitvale to Laundry Farm.

Charlottesville & Southern.—This company proposes to build a road from Charlottesville, Va., to the James River, a distance of 23 miles, to connect the James River branch of the Chesapeake & Ohio with the main line of that road. R. P. Valentine, of Charlottesville, is President.

Chicago & Eastern Illinois.—A local paper states that engineers have just completed the survey of the proposed extension of this road from Tuscola, Ill., to Shelbyville, Ill., a distance of 40 miles, where connection can be made with the Cleveland, Cincinnati, Chicago & St. Louis. At a meeting held at Tuscola a committee of fifteen citizens was appointed to aid in securing the right-of-way.

Chicago & Erie.—The new proprietors of this road are making rapid progress with the work of improving the line which has been going on for some time past. Of the 220 short trestles on the line 140 have been filled in during the present year. The remaining 80 will be rapidly changed. Iron pipes are put in for the waterways at most of these places. There are very few long trestles on the road. Plate-girder bridges are to be erected in place of 58 wooden structures, varying from 15 to 70 ft. in length. Bids for these iron bridges are now being received. Stone abutments are being put in at 10 iron bridges which now rest on timber foundations. A large amount of ballasting is being done.

Cincinnati & Atlanta.—The survey of a railroad from Athens, Tenn., westward about 22 miles to the Cincinnati Southern has been commenced. It is also to connect Athens and the Knoxville Southern at near Hiwassee Gap, which will unite by direct railroad the coal of the Cumberland and the iron ore of the Starrs mountain.

Columbia Central.—A bill has been introduced in the United States Senate to incorporate this company, to construct a road in the District of Columbia.

Cumberland, Fort Payne & Atlantic.—This company has completed its organization with Chancellor McSpadden, President, and W. W. Haralson, Secretary. It is proposed to build a railroad from Bridgeport, Ala., via Fort Payne, Center, Piedmont, Ala., and Tallapoosa, Ga., to a connection with the Savannah, Griffin & North Ala-

bama branch of the Central of Georgia at Carrollton, and from thence to Brunswick, Ga.

Drummond County.—This road, which is to extend from St. Hyacinthe to Nicolet, Quebec, is now completed from Nicolet to Drummondville, 35 miles. It is well ballasted and the bridges are steel. The stations are neat and are connected by telephone. The line is graded to St. Hyacinthe, and the whole line is expected to be opened for traffic about Dec. 1.

East Shore Terminal.—This company, which is building a belt road at Charleston, S. C., has begun tracklaying on Market and Concord streets. Connection is made with the tracks of the railroad at Washington, Chapel and Columbus streets. The wharves purchased are under, going a complete overhauling.

Forest City & Sioux City.—The 16 mile section of this road between Forest City and Gettysburg was completed on Sunday last. It is expected that the Chicago & Northwestern, which connects with the new road at Gettysburg, will operate it.

Georgia Southern & Florida.—The Tifton and Thomasville extension has been surveyed and located. We are informed by Chief Engineer W. H. Wells that the work is to be done by L. R. Wright, to whom the contract was let on Aug. 20. Grading has been begun. The work is light. The maximum grade is 52 ft. per mile and the maximum curvature 4 degrees.

Great Northern.—The County Auditor at Seattle, Wash., has received for record the \$30,000,000 mortgage of this company issued for the purpose of constructing the extensions to Puget Sound. It is made in favor of the Central Trust Co., of New York.

A decision will soon be reached regarding the selection of a pass through the Cascade mountains, on the Pacific Coast extension. When this decision is made, locating parties will be started out at once, and the construction begun.

Hidalgo.—The construction work on this Mexican road is being pushed between Somo-Riel and Tulancingo. It is expected that the first train between Mexico and Pachuca will be run by the middle of this month.

Kentucky & Cumberland.—The officers of this company say that they expect to let contracts for work on the Frankfort end within a few weeks. The proposed line of the road is from Frankfort, Ky., southward through Lebanon, Columbia and Burksville, Ky., to Sparta, Tenn., 140 miles. The country is not difficult and the locating survey is now in progress.

Keweenaw, Green Bay & Western.—Engineers began on Sept. 2 the survey of this line from Keweenaw, Wis., westerly to a connection with the Green Bay, Winona & St. Paul at Green Bay, a distance of about 25 miles.

Kinneconick.—Messrs. J. P. Reynolds & Co., of Rockland, Ill., are the contractors for building this road, which is to run from quarries on Kinneconick Creek, Ky., to the Ohio River. The line is about 9 miles long and 3 miles of track is already laid.

Lake Erie, Wooster & Muskingum Valley.—Messrs. Ryan & McDonald have made a proposition to the citizens of Wooster, O., to build a road from Wooster northwesterly, about 20 miles, to Lodi, where connection can be made with the Akron branch of the Baltimore & Ohio, which is now under construction and is to be finished during the present year. It is proposed to utilize the right of way and partially constructed road-bed of the above-named company. Citizens of Wooster have taken action looking to the raising of the required funds. It is said that Lodi will also aid the road by a grant of money.

Lehigh Valley.—The company has a corps of engineers surveying a route for the proposed Montrose Railroad extension down the east side of Snake Creek to Riverside, Pa. A former survey was made on the west side. Which route will be selected will be determined chiefly by the difference in the cost of construction.

Long Lake & Saskatchewan.—This road has been completed from Regina to Prince Albert, N. W. T., a distance of 185 miles, directly north. The formal opening of the road will take place shortly. The contractors have gone to work on the Calgary & Edmonton.

Los Angeles Terminal.—Articles of incorporation were filed last week for a company with this name, to construct and acquire by lease, purchase or consolidation, and operate a railroad with branches, in the counties of Los Angeles and Ventura, Cal. The principal place of business is Los Angeles. It is proposed to run the road from San Pedro Bay to Los Angeles, thence by way of the San Fernando Valley to Hueneme, in Ventura County. One branch will run from Los Angeles via Pasadena to Altadena; another will run to Santa Monica. A branch is proposed to run to Glendale and the Verdugo cañon. Another branch will connect with the Southern Pacific at Saticoy or Montalvo. The estimated length of the line and its branches is 140 miles, and the capital stock of the company is \$3,000,000. Mr. Hobart is the treasurer of the company. It is understood that the same parties have secured control of the Los Angeles, Pasadena & Glendale, and will make it standard gauge, so as to incorporate it in the new system. The existing lines of the last named company aggregate 25 miles.

Louisville & Nashville.—It is announced that the contract for the Clarksville Mineral branch of this system has been let. The road will extend from Clarksville south to Dickson, Tenn., on the Nashville, Chattanooga & St. Louis, 32 miles, with a branch of 10 miles to a new furnace that is to be constructed by the Southern Iron Co. A 100-ton furnace is under construction at Clarksville.

Macon & Birmingham.—Progress is reported in the location of the Macon & Atlantic division of this road to Savannah, Ga. The surveyors are now between Guyton and Savannah. The contract has been let all the way to Macon, and contractors are only waiting for the completion of the surveys to begin work at every point.

Macon & Dublin.—Grading on this road, which is to extend from Macon to Savannah, Ga., 155 miles, is nearly finished. The portion between Macon and Dublin, 54 miles, is ready for tracklaying, which will be begun Sept. 15. It is expected that this section will be in operation by Nov. 1. The work is quite heavy; the maximum grade is 40 ft. per mile, and the maximum curve, 4 degrees. The Illinois & Georgia Improvement Co. has the contract for constructing the whole road and has let to Meyrick & Bowman, of Macon, Ga., the

contract for earth work. D. T. Rogers has the contract for trestles and bridges. It is stated that all the money needed for building the road has been raised. D. B. Dunn is Chief Engineer of the railroad company and James T. Wright is President of the construction company.

McKeesport & Bellevue.—Right of way for an extension of this road from Bellevue to Fayette, Pa., a distance of about 14 miles, has been secured. It is said that the road will be continued to Morgantown.

Mexican & Central American.—Mr. John C. Olliphant, Chief Engineer of the Mexican Pacific Railway, at Toluca, Mexico, writes that he is also Chief Engineer of the Mexican & Central American Railway, from Tehuantepec to the Guatemala frontier, crossing the Mexican Pacific near Toluca. He will be ready on Oct. 1 to let contracts for constructing the Mexican & Central American road in small or large sections.

Mexican Northern.—J. H. Hampson has the contract for building this road, the line of which extends from Escalon, on the Mexican Central, northward 85 miles, to Sierra Mojada, an important mining camp in the state of Coahuila, from which large quantities of ore have been shipped during the past four years. The whole line of the road has been surveyed and about 20 miles is already graded. The grading force proceeds at the rate of about a mile a day, and tracklaying will be begun very soon, some of the material having been already purchased. The Chief Engineer of the road is Vinton P. Safford, Escalon, Mexico.

Missouri Pacific.—Engineers have been sent out to complete the survey of the line between Carthage, Mo., and Batesville, Ark., a distance of 220 miles.

Mobile, Jackson & Kansas City.—It is expected that the whole line of this road, from Mobile, Ala., to Jackson, Miss., will be put under construction within 60 days. The Anglo-Southern Construction Co. will probably let sub-contracts within that time.

Monterey & Mexican Gulf.—The line has been put in operation from Linares, the late southern terminus, to Carrizo, Mex., 30 miles. It is expected to complete the track from Carrizo southward to Victoria this month.

Newport & Sherman's Valley.—Work has commenced on this Pennsylvania road. It will probably be built to Loysville, 16 miles, this fall, and in the spring it is expected to be extended to New Germantown, making 30 miles in all through Perry County. The contract has been let to S. Gring, of Newport, Pa. He hopes to begin tracklaying by Oct. 1 and to have the cars running to Loysville by Jan. 1. This is not to be a branch of the Diamond Valley as previously stated.

New York, Philadelphia & Chicago.—The termini of this road, the incorporation of which was noticed last week, are Franklin, Pa., and Clearfield, Pa. The value of this project lies in the fact that it is designed to connect two Vanderbilt properties, the Jamestown & Franklin branch of the Lake Shore & Michigan Southern and the Beech Creek, thus forming a direct route from the west to the Pennsylvania anthracite regions and to Philadelphia. The Beech Creek connects at Williamsport, Pa., with the Philadelphia & Reading for Philadelphia. The capital stock is \$2,250,000, not \$250,000 as stated last week.

Ohio & Mississippi.—Grading is in progress on the Rock Creek branch, which is being extended from Mitchell, Ind., to the Big Four quarry, a distance of two miles. S. C. Fritsch, Mitchell, Ind., is engineer in charge of construction.

Oregonian.—Carpenters have begun work on strengthening the bridges on the East Side Division of this road preparatory to making the road standard gauge. The bridges over Silver, Abiqua and Thomas Creeks and the Pudding and South Santiam Rivers are to be entirely renewed. This work will be done by the company. The line for the extension from Coburg through Springfield to Jasper, Or., on the Middle fork of the Willamette River has been located, and bids for construction received. An officer writes us that no contracts have yet been let. This extension is all light valley work with the exception of the last mile. The line has no grade exceeding 1 percent., and the maximum curves are 10 deg. The crossing of the McKenzie River will require a 250-ft. bridge. Surveys and locations for a line from East Portland through Lents and Scremore, down Rock Creek to Clackamas River where Clear Creek enters; up Clear Creek to Summit, near Clarks; thence by Buckner Creek to Milk Creek, through Union Mills, and Molalla to Silverton, Or., a distance of about 54 miles, are being made. Twenty miles of this line will be heavy mountain work with two or three short tunnels. Clackamas River will require a span of about 300 ft. The rolling stock and some of the rails have already arrived. Lewis Tasheiro, Portland, Or., is Chief Engineer.

Pachuca, Zacualtipan & Tampico.—The Government Inspector states that several kilometers have been already graded at the northern end of the Pachuca-Zacualtipan division of this Mexican road, and that the locating survey there is being completed. Mr. J. F. McMackin is in charge of a corps to locate the line between Apulco and Tulancingo, starting at the former place; and it is announced that the contract for a long section has been taken by George Brinkman, late of the firm of Messrs. Brinkman & Turnbull.

Paducah, Tennessee, & Alabama.—The locating surveys of this line have reached Paris, Ky. Work on the roadbed from the state line to Paris has been commenced and cars will probably be running to Murray, Ky., very soon.

Pennsylvania, Lehigh & Eastern.—The officers of this road state that the contracts for building will soon be let, as the surveys have been completed and right of way secured. This road is the successor of the Lehigh & Eastern, and the proposed line is from Tomhicken, Pa., through the anthracite coal regions in Luzerne, Carbon, Monroe and Pike counties to a connection with the New York, Lake Erie & Western at Port Jervis, N. Y., a total distance of about 106 miles.

Philadelphia & Reading.—Discussion about the proposed elevated line of this company, to extend the road from its present terminus in Philadelphia to Twelfth and Market streets, which died out several months ago, has been revived by the announcement that a new plan has been prepared and is to be presented to the Philadelphia city government. The city desired an elevated line for 2½ miles, while the road felt able to make the necessary improvements only for a much shorter dis-

tance. President McLeod has now prepared plans which provides for about one mile of elevated road at an estimate cost of \$8,000,000.

Philadelphia & Seashore Short Line.—Work has been resumed on this road at Cape May, N. J., after a suspension of over three months, which has been owing largely to legal difficulties.

Portland, Salem & Astoria.—A company by this name has been incorporated at Portland, Or., with a capital stock of \$1,500,000, to build a railroad from Portland northwest to Astoria, and from Portland southward to Salem. The company seems to be the successor of the Astoria & South Coast, whose road it has received authority to acquire.

Port Townsend Southern.—This road is now in operation from Port Townsend, Wash., southward 20 miles. The grading forces are at work about 8 miles south of the present terminus. This road will connect at Olympia, Wash., with the Olympia & Chehalis Valley, which is to be widened to standard gauge. In places where cuts and new grades have been made the rails for the broad gauge are now being laid, but the other portion of the line will be widened by laying the permanent track outside of the present narrow track, and as soon as the road is widened it will be turned over to the Port Townsend Southern.

Potomac Valley.—The surveys for this line as well as the location have been completed, and we are informed by an officer of the company that proposals will probably be asked for at an early day, as it is desired to have the line completed as early as practicable after the opening of the Philadelphia, Harrisburg & Pittsburgh between Harrisburg and Bowmansdale, Pa. (formerly the Harrisburg & Potomac), as in connection with that road and intervening lines of the Western Maryland a direct connection between the Philadelphia & Reading at Harrisburg and the Baltimore & Ohio at Cherry Run, Pa., will be established. The work will include two iron bridges, one across the Conococheague Creek at Williamsport, Pa., about 200 ft. in length, with trestle approaches, and the other over the Potomac River near Cherry Run, Pa., about 650 ft. long.

Reynoldsville & Falls Creek.—This road has been extended from Reynoldsville, Pa., westward to Soldiers' Run, a distance of 8 miles, and two trains a day are now running each way between Falls Creek and Soldiers' Run, 16 miles.

Rio Grande Western.—The road is pushing its extension up the Sanpete Valley, Utah. The construction train is now running as far as Clinton, and the rails are fast being laid. Grading is finished nearly to the divide. Two hundred men and teams are at work on the grade this side while 75 men are employed in tracklaying and hundreds are at work in the mountains cutting ties. Right of way is bought as far as Fairview. It is the intention to have the road in operation as far as Manti, Utah, by January next. The contract for grading from Fairview to Ephraim has been taken by a Springfield firm. Henry Beal, of Ephraim, has taken the contract for seven miles, which will bring the grading to Manti. Fred Alder has obtained the contract to deliver 5,000 ties along the line after the road is built.

Rondout Valley.—This road, to extend from Ellenville, N. Y., 26 miles north to Kingston, N. Y., through the towns of Wawarsing, Rochester, Marbletown and Rosendale, was incorporated at Albany this week with a capital of \$200,000.

San Jose & Southern.—This company has recently been incorporated in California to build a line between San Jose and Los Angeles. Surveys are being made between these points.

Sherman, Denison & Dallas.—The first 10 miles of this road, which it is proposed to extend from Denison to Dallas, Tex., a total distance of 80 miles, is expected to be completed by Oct. 1. The work is of an easy character, the maximum grades being 66 ft. to the mile and the maximum curves four degrees. George M. Jarvis, of Denison, Tex., is Chief Engineer.

Sioux City & Northwestern.—Surveying parties have been at work for about three weeks on the route of this proposed road. The general direction of the line from Sioux City is northwest, and the intention is to run a line to the nearest available point in the Black Hills, probably Rapid City or Deadwood. The route is found to be easy, and the only drawback is the difficulty in securing the consent of the Sioux Indians to cross the great reservation, which stretches 125 miles in the path of the road. The President of the company is A. S. Garretson, and the Vice-President is John F. Duncombe, whose headquarters are at Sioux City. It is proposed also to build a road from a point near Niobrara, Neb., to Pierre, the capital of South Dakota. This will necessitate the building of a bridge across the Missouri at a point somewhere above Niobrara. It is proposed to use the Pacific Short Line bridge at Sioux City.

Skagit Valley.—This road, for which articles of incorporation were recently filed, proposes to establish a terminus at Chicago, on Whidby Island, state of Washington. Location parties are to start out at once, and establish the line through the Skagit Valley. The route further east has not yet been decided on.

South Carolina.—Track on that part of the line between Clinton, S. C., and the Saluda River, 18 miles, is now being laid and will soon be completed, so that by the middle of October trains will run through to Greenwood, S. C., the track already having been laid from the Saluda River to that place. A considerable portion of the roadway has been graded on the Georgia side, and the contractors are now at work near Atlanta.

Southern Pacific.—The extension from Newman, Cal., southward towards Armona has been finished and is now in operation as far as Los Baños, 21 miles from Newman. The principal places through which the line passes between these points are Gustine, Linora, Ingomar and Volta. The grading is completed to Armona, which is on the Southern Pacific line leading from Goshen westward to Alameda. The contractors on the Merced Division are Messrs. Turton & Knox, of Sacramento. They have completed 13 miles of track and the work is being rapidly pushed.

The right of way has been secured and the engineers have staked off the line for an extension of the Thibodaux branch to the Lafourche refinery, some six miles north of Thibodaux, La., and work will begin soon. The engineers have been instructed to continue their survey up the bayou as far as the town of Labadieville, La., 10 miles northwest of Thibodaux, to which the branch will probably be continued in the near future.

Spartanburg, Glendale & Clifton.—Application

will be made at the next session of the General Assembly of South Carolina for a charter to incorporate a company, to build a railroad through Spartanburg to Whitney, Glendale, Clifton and other points in Spartanburg County. Among the incorporators are: A. H. Leftwich, J. B. Cleveland and A. E. Moore.

Stewiacke & Lansdowne.—After repeated failures of Mr. Mudge and his associates holding the original charter of the Hants Central road to give satisfactory evidence of their ability to construct a road, the Dominion Government has awarded the Stewiacke & Lansdowne the subsidy voted by Parliament to the Hants Central. The S. & L. will now be put under construction and the projectors promise that it shall be completed without delay.

Suburban Rapid Transit.—A large force of laborers is at work on Third Avenue, New York City, north of 170th street, on the double contract of widening the avenue for the city and laying the foundations for the iron columns which are to support the roadway of this line. Sixty-four holes have thus far been sunk. A wooden frame 8 ft. square and 20 in. deep is laid at the bottom of the excavation, and filled with mortar, sand and small stones. This is tamped down and allowed to harden, after which the frame is removed, and the operation is repeated with frames 7 ft. square, 6 ft. square and 5 ft. square. This is finally capped with a block of granite 4 ft. square. The iron columns are bolted to this block. Alston Gerry & Co., the contractors, are to complete the foundations from 170th street to Tremont by Nov. 15, with a forfeit of \$50 for every day exceeding the date of contract and a bonus of \$50 a day for each day gained. It is said the road will be in running order to Tremont by January. When the extension of the road is completed, the 170th street station will be removed to Wendover avenue. North of this there will be stations at 174th street and 177th street, Tremont.

Union Pacific.—Officials of the company state that the line from Portland, Or., to Puget Sound is all located and the right of way is being secured as rapidly as is consistent with business of such a character. About 1,500 graders are now employed and much of the work of construction contracted for. Graders will be put at work on the Tacoma water front within 30 days, if the bill is passed allowing the company a right of way through the Puyallup reservation.

Warren & Arkadelphia.—The citizens of Warren, Ark., are trying to secure the building of a road from Warren northwesterly about 20 miles to a connection with the St. Louis, Arkansas & Texas.

Wisconsin Central.—The company's surveyors have completed a survey for a branch to the new iron range known as the Messenlar.

Wisconsin Midland.—The proposed line of this road is from Fond du Lac, Wis., northward along the shore of Lake Winnibago. The contractors are Miller & Loomis, Chicago, and their forces are now at work.

GENERAL RAILROAD NEWS.

Brooklyn & Brighton Beach.—The company has defaulted on the payment of the semi-annual interest due Sept. 1. The amount is \$12,500.

Chesapeake & Ohio Canal.—Judge Alvey, of Maryland, has rendered a decision in favor of a sale of the property of this canal, which has been in litigation for many months. The usual speculations concerning the prospects of building a railroad along the bed of the canal, which the new Washington & Cumberland Railroad Co. has proposed to do, are published since the announcement of Judge Alvey's decision, but it seems that the matter will not be finally settled until a decision is rendered by the United States District Court. It is said that such decision will probably be rendered soon. The Baltimore & Ohio Railroad holds some of the canal company's preferred bonds, and will doubtless strenuously contest any measure threatening to impair their value.

Cheshire.—The Fitchburg and Cheshire Railroad directors both held meetings in Boston last week, and approved the agreement for the transfer of the control of the latter road to the former. The arrangement provides for an exchange of five shares of Fitchburg preferred for four of Cheshire preferred. The Fitchburg is to assume the debt of the Cheshire, amounting to \$800,000 of 5s and \$100,000 of 4s, and the Cheshire stockholders are to retain their treasury assets, which are estimated to be worth from \$7 to \$10 per share. The terms of the purchase will be submitted to the stockholders for ratification at the annual meeting Sept. 24, and the new arrangement will probably go into effect Oct. 1. The Cheshire extends from a connection with the Fitchburg, 10 miles west of Fitchburg, Mass., northwesterly to Bellows Falls, Vt., 54 miles. It connects at the latter place with the Rutland road, now controlled by the Delaware & Hudson Canal Co., and with it forms a through line to Lake Champlain. Before the completion of the Hoosac Tunnel some through passenger business between Boston and Saratoga was done over this route. The Cheshire has earned about \$600,000 gross and \$216,000 net annually. It pays \$51,000 rental to the Fitchburg and \$48,000 interest on bonds. It has paid 6 per cent. dividends since 1886, expenses being 70 per cent. of the earnings. The company leases the Monadnock road, 16 miles long, from Winchendon, Mass., to Peterboro, N. H., but keeps the accounts separate.

Chicago & Erie.—The purchase of this road by the New York, Lake Erie & Western was immediately followed by a notification from the new company that it would at the expiration of ten days cancel the contract by which the Wabash now uses the company's track between the southern limits of Chicago and Laketon, Ind., a distance of 72 miles. This contract, which has been in existence four years, was originally made for twenty years but was recently changed so as to require only ten days' notice on either side for cancellation. The Wabash has for some time threatened to build a line of its own from Butler, Ind., to Chicago, but this probably could not be completed for many months. The Erie is of course jealous of the Canadian Pacific competition which is carried on over the line in question by means of a traffic agreement with the Wabash, but the Wabash officers profess to believe that the Erie will be ready to make a new contract not unfavorable to the conduct of the existing Canadian business.

Danville & New River.—This road was sold under foreclosure at Danville, Va., Aug. 27, to J. Wilcox Brown, of Baltimore, who is said to be a representative of the Richmond & Danville. Notice of the sale was given in our issue of June 27.

Knox & Lincoln.—Representatives of stock in this company met at Bath, Me., Sept. 10, and voted to sell the

road by 2,826 shares against 139. Waldborough voted against the sale, and a petition for an injunction will be heard Monday, at Rockland.

Mexican Central.—The contract between the Mexican government and this company for the sale of the subsidy calls for \$14,687,470 Mexican silver dollars. The payments are to be made proportionately as the money is paid to the government by the syndicate placing the loan. There is good basis for the belief that the entire sum will be paid this year, or early in 1891. The contract specially precludes payment of subsidy on the 16 miles on the Pacific coast, and also does not include any construction which the company may make hereafter. In all such cases the Mexican Central is hereafter given a subsidy. The company continues to collect subsidy until the last payment is made, at which time it credits the government with all such collection from July 1, 1890. Mexican dollars are now worth 92½ cents.

Missouri, Kansas & Texas.—The reorganization of the company will be completed and the new securities issued as soon as the trustees of the old seven per cent. and general mortgage bonds certify that those mortgages have been satisfied. It was expected that this would be done so that the new securities could be issued by the 15th of this month, but it is not thought now that so early delivery will be possible.

Attorney-General Hogg, of Texas, has filed in the Travis County district court, on behalf of the state, a suit against this road for the forfeiture of its charter. The petition alleges wilful violation of the laws of Texas by exceeding its charter powers in various particulars; that it has fictitiously bonded itself for \$37,000 per mile and stocked itself for \$35,000 per mile; that it has absorbed and controls, in violation of the state constitution, seven other railroads in the state; that it has consolidated these roads and has mortgaged each one of them to secure consolidated bonds issued by it and other indebtedness to the amount of over \$49,000,000, and that these roads have been stripped and deprived of all their property. Friends of the road say the motives for this suit are of a political nature.

Nashville, Chattanooga & St. Louis.—The stockholders at the annual meeting in Nashville Wednesday authorized an increase of 10 per cent. in the capital stock of the company. The annual report shows the gross earnings for the year to have been \$3,550,461; operating expenses, \$2,139,851; net earnings, \$1,410,610, most of which was expended in extensions, improvements and the building of new shops at Nashville.

New Brunswick.—The main line and principal branches of this road passed into the hands of the Canadian Pacific Aug. 23, in accordance with the lease, but the Fredericton branch is not included, and will continue to be operated by the New Brunswick road. H. P. Timmerman is General Superintendent.

Rochester, Hornellsville & Lackawanna.—Mitchell S. Blair, of Angelica, N. Y., was appointed Receiver of this road by Judge Lewis at the General Term at Buffalo, N. Y., Sept. 9. This company has been merged into the Lackawanna & Southwestern, and it is rumored that the receivership will be extended to the latter company.

San Antonio & Aransas Pass.—A meeting of the first mortgage bondholders was held in New York this week, at which bonds to the amount of between \$3,000,000 and \$4,000,000 were represented. Since the road was placed in the hands of a receiver an examination into its physical and financial condition has been made by E. C. M. Rand, an expert, engaged to do the work by order of the bondholders. Mr. Rand submitted a long report asserting that the property was valuable, with a promising future, but that it was important that sufficient money should be expended on it at once to complete it and put it in good working order. Mr. Rand says: "This is not a road dependent upon any of its connections, but is strictly an originating road, which can in many cases make arbitrary rates, and exist independent of any other line in Texas." The construction of this road was begun in the summer of 1886, and about 650 miles are now completed, including the main line from San Antonio to the harbor of Aransas Pass, on the Gulf of Mexico, a distance of 150 miles; the line from Kennedy (on the main line) to Houston, 176 miles; the line from San Antonio to Kerrville, 71 miles, and 116 miles of the line to Waco, Tex. Beside these, there are two or three smaller branches. The work of construction was done by Mr. Kennedy, who now has a claim against the company of \$2,800,000, and in order to complete the Waco division a settlement must first be made with Mr. Kennedy. A general discussion of the situation was engaged in by the meeting, but no definite action was taken. Mr. Uriah Lott, President of the company, made a speech in which he insisted that the road was not in nearly as bad a condition as had been represented.

Shenandoah Valley.—The plan for the reorganization of this company, which has been in the hands of a receiver for more than five years, has been published. The road is to be sold at foreclosure sale on Sept. 30. The reorganization plan contemplates the issue of \$10,000,000 of fifty-year 5 per cent. mortgage bonds, \$4,500,000 of preferred stock and \$2,500,000 of common stock. The preferred and common stock are to be transferred to the Norfolk & Western in consideration of certain guarantees. The holders of present Shenandoah Valley first mortgage 7 per cent. bonds will receive par and full interest in new mortgage bonds, being at the rate of \$1,420 a bond. The holders of the Shenandoah Valley general mortgage bonds pay an assessment of \$66 a \$1,000 bond and receive \$1,100 in Norfolk & Western preferred stock. The new bonds are to be guaranteed by the Norfolk & Western. Of the \$10,000,000 authorized, \$3,223,400 will be issued in taking up the present first mortgage bonds, \$4,276,600 will be used in paying off receiver's certificates, car-trust obligations, costs of reorganization, for double tracking and improvements and equipment, and the remaining \$2,500,000 will be spent in securing a terminus in Washington, D. C., and in the construction of a road from Front Royal, Va., to that city. It is said that the plan will be carried out without difficulty, as all opposition to the committee has been allayed.

The engineers making the locating survey for the line from Front Royal to Washington are now at Markham, Fauquier County. The line will parallel the Virginia Midland as far as Rectortown, where it goes to Middleburg and thence through Loudon to Washington.

South Atlantic & Ohio.—Mr. J. D. Bailey has been appointed Receiver of this road, which is in operation from Bristol, Tenn., to Natural Tunnel, a distance of about 45 miles, on a bill filed by J. Wilder and others. The Virginia, Tennessee & Carolina Steel & Iron Co. has

obtained control of the road, and it is alleged, had misappropriated the funds and mismanaged the road.

Toledo, Ann Arbor & North Michigan.—The South Lyons branch of this road will hereafter be operated by the South Lyons & Northern. The branch extends from Leland to Lyons, Mich., eight miles.

Wabash.—The annual statement of the business of this road presented at the annual meeting is as follows: Gross earnings, \$13,352,872; operating expenses, \$9,673,221; net earnings, \$3,679,651; received from rent of tracks, etc., \$272,435; total, \$3,952,086; taxes, rentals, etc., \$851,473; net revenue applicable to interest, \$3,100,612; interest on bonds (including two dividends on debenture bonds) and rentals of leased lines, \$2,862,821; surplus, \$237,792. The road has been doing a heavy business both east and west of the Mississippi, but earnings have been affected somewhat by low rates and rate disturbances.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, Sept. 10, 1890.

The Central Traffic and Western Freight associations are in session this week with long dockets before them. Chairman Blanchard was not ready to present his proposed memorial to the Interstate Commerce Commission in full, owing to delay in obtaining necessary statements from the Commission. The Central Traffic Association made no headway in the bill of lading matter. The Western lines refused to adopt it, and the Grand Trunk and Wabash refused to use it unless all the lines did. To-day the Grand Trunk gave notice it would not use it until it was used by all other lines. The Lake Shore then gave notice that at competing points it would give shippers the option to use the old form if necessary. As the new bill is in use westward by all lines and eastward by a large majority of the lines, the committee resolved that the efforts to secure its general adoption should be continued, and that it be used at all points where the carriers have not heretofore disagreed.

At the meeting of the Western Freight Association the application of the Chicago, Rock Island & Pacific to establish a rate of 17 cents on corn and 19 cents on wheat from Council Bluffs, St. Joseph and Kansas City to Chicago was refused, as was the application of the Chicago & Alton to establish rates of 17 cents on corn from Kansas City to Chicago, 12 cents Kansas City to St. Louis, and 19 cents on wheat, Kansas City to Chicago, and 14 cents, Kansas City to St. Louis; but the roads gave the required 10 days' notice that they would establish the rate nevertheless. Further conferences were held which resulted in a new application to the Commission to modify the order in so far as it changes existing and long established differentials, it being understood that it was not the intention of the Commission to effect such a result. No answer has yet been received from the Commission to the petition for rehearing. The reduced rates of the Alton and Rock Island will be met by the other lines so far as competition makes it necessary, but pending further action by the Commission it is not probable that the other lines will go further than this; and it is quite likely that no change in rates will be made until Oct. 1. Meanwhile roads which believe the order was made without sufficient consideration of the circumstances, and especially without observing the effect of the changed conditions arising from the heavy advance in the price of grain and the short crop, are hoping some shipper will take the matter into the United States Courts.

The order of the Interstate Commerce Commission suspending its grain rate order until Sept. 15 refers only to those companies which petitioned for a rehearing. Among those which did not sign this petition were the Chicago & Northwestern, Chicago, Burlington & Quincy and Wisconsin Central.

In the opinion accompanying the original order for a reduction in the rates on food products reference is made to a "universally admitted severe agricultural depression," and the opinion says, "that the prices which agricultural products now bring do not secure to the producer his equal share of the general prosperity is apparently not disputed." In this connection it is of interest to note that Senator Paddock, of Nebraska, in a speech in the United States Senate on Monday of last week, vigorously denied that the condition of Nebraska farmers was as bad as had been represented. He said that these people were the most prosperous farming class he knew of. They have doubled the wealth of the state within the last decade and have secured large returns on their principal. Of the \$64,000,000 in the banks of the state 70 per cent. consists of the deposits of farmers. This sum would pay off every farm mortgage in Nebraska.

Chairman Goddard of the Western Passenger Association has fined the St. Louis, Keokuk & Northwestern \$15.85, being the value of a ticket from St. Louis to St. Paul, which the Alton charged that road with selling for \$14. This the defendant company admitted, seeking to justify its action by the St. Louis joint rate sheet, which authorizes a \$14 rate, but the chairman held that it had no right to make the rate, as it was not reasonable in comparison with other rates between the river points and not in accordance with association rules.

The Rock Island has issued a notice to shippers and agents not to receive packages containing liquors from points outside of Iowa destined to points in that state unless accompanied by a certificate showing that the consignee is authorized to sell such liquors.

The Trans-Missouri Freight Association has voted not to change its headquarters from Kansas City to Chicago. The outcome of the question of liability arising through the explosion of naphtha on the steamer "Tioga," referred to in my dispatch of July 23, is the filing of a suit in the United States District Court by the Union Steamboat Co. against the Genesee Refining Co. to recover \$125 freight on the oil. The steamboat company has always claimed ignorance of the nature of the shipment, and that the fault was with the shippers. This was in accordance with the coroner's verdict. The oil company, on the other hand, claims that the oil was handled so carelessly that the blame is removed from the shippers, and have filed an answer and cross bill alleging that the steamboat company agreed to transport the oil from Buffalo to Chicago, using due care and diligence in handling, which it failed to do, and consequently the shippers are entitled to recover the value of the oil, less the freight charges.

Traffic Notes.

The Buffalo Weighing and Inspection Bureau in August handled 1,915 tons of freight, collecting \$1,207. The expenses of the bureau were \$594.

The old elevator of the Ogdensburg & Lake Cham-

plain, at Ogdensburg, was burned this week with 500,000 bushels of corn and oats. It was well insured.

The Kansas City, Fort Scott & Memphis has begun charging demurrage at Kansas City, and this action will, it is said, lead to the speedy organization of an association in that city.

The Maine Central Railroad Co.'s estimate, based upon careful figures, places the tourist travel this summer to Maine through all her gateways of travel at 100,000.

The President of the Atchison, Topeka & Santa Fe has informed the farmers in Oklahoma that the road will supply them with \$10,000 worth of wheat at cost and wait until the crop is harvested for the money.

The Trunk Line Passenger Committee has made a rate of \$1 per train mile for the excursion of the British Iron and Steel Institute in connection with the meeting of the Institute at Pittsburgh in October.

In the month of August there was transported through the St. Mary's Falls (Mich.) Canal 1,411,294 tons of freight and 7,772 passengers. Of the freight tonnage there were 382,768 tons coal, 559,005 barrels flour, 234,143 bushels corn, 1,313,172 bushels wheat, 14,000 bushels other grain, 5,245 tons copper, 5,911 tons building stone, 771,583 tons iron ore, 3,788 tons pig iron, 20,432 barrels salt, 50,065,000 ft. lumber, 160 tons silver ore.

Oil Rate Decision.

The Interstate Commerce Commission on Sept. 5 filed its decision by Commissioner Schoonmaker in the case of Rice, Robinson & Witherop against the Western New York & Pennsylvania.

The complainants alleged that the roads charged 34 cents per barrel on petroleum from Titusville to Buffalo, N. Y., and but 12 cents per barrel from Titusville to South Amboy, N. J.; and that, by making a more favorable charge to shippers in tanks than to shippers in barrels, unjust discrimination was made in favor of the Standard Oil Co.

The Commission holds: The acquisition and consolidation by a rail carrier under one system of management of different competing lines of road serving the same territory cannot create a right to deprive the public of the benefits of fair competition.

A carrier that employs different methods for the transportation of petroleum oil and its products in carloads, for example, tank cars, in which the oil is carried in bulk, and box cars, in which the oil is carried in barrels, is not relieved from its duty in respect to equality of rates by the difference it makes between its patrons in the mode of carriage, but its charges for like quantities carried between like points of shipment and destination must be equal upon the commodity itself, irrespective of the mode of carriage or the tank or barrel package in which it is contained. Differences in circumstances and conditions of transportation that are of a carrier's own creation or connivance, or that by reasonable effort on the part of a carrier might be avoided, cannot justify exceptional rates.

A tank used in carrying oil is deemed by carriers part of the car, and the rate is charged only upon the contents, while for carriage in box cars the barrels containing the oil are treated as freight and the rate is charged both for the weight of the barrel and its contents. The prevention of this prejudice to shippers in barrels requires that, for purposes of rates, when a carrier uses both tanks and box cars for carrying oil in car loads, the barrels shall be deemed part of the box car, and that, as in the case of transportation in tanks, the rate shall be charged only for the weight or quantity of oil carried, exclusive of the weight of the barrels, and be the same for like weight or quantity carried in tanks.

The allowance by a carrier to a shipper of oil in tanks of 42 gallons, or any number of gallons, from the actual quantity put in a tank, for alleged leakage or waste in transportation, is, in the absence of a corresponding allowance to shippers in barrels, unjust discrimination and unlawful.

The classification of petroleum oil and its products in carloads adopted and generally applied by carriers is the same, and the rates upon oil and its products should correspond with their classification and be alike.

Georgia Freight Rates.

The Georgia State Railroad Commissioners have issued an order rescinding certain privileges heretofore granted to the Central, the Plant, the Richmond & Danville and the East Tennessee systems and ordering them to conform to the commissioners' standard tariffs "with 10 per cent. added for all distances except on classes C, D, F, J, P. and rosin." The effect of the order is to reduce rates on the Central below Macon, making them more nearly with those on other parts of the road. It has a similar effect on the East Tennessee. On the Atlanta & West Point rates will be considerably reduced.

The commission has also promulgated a rule requiring the roads to make a reduction of 10 per cent. on all shipments which go over two or more roads. This applies of course only to interstate traffic. Roads are not forbidden to divide a through rate in such proportions as they may agree upon.

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, Sept. 6, amounted to 71,503 tons, against 52,376 tons during the preceding week, an increase of 19,127 tons, and against 49,521 tons during the corresponding week of 1889, an increase of 21,982 tons. The proportions carried by each road were:

	W'k to Sept. 6.		W'k to Aug. 30.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	8,662	12.1	3,562	6.8
Wabash.....	4,107	5.7	2,514	4.8
Lake Shore & Michigan South.....	11,313	16.1	9,441	18.0
Pitts., Ft. Wayne & Chicago.....	7,667	10.7	5,755	11.0
Chicago, St. Louis & Pitts.....	8,993	12.5	6,138	11.7
Baltimore & Ohio.....	4,570	6.9	2,763	5.3
Chicago & Grand Trunk.....	11,294	15.8	9,495	18.1
New York, Chic. & St. Louis.....	5,827	7.8	5,608	10.7
Chicago & Atlantic.....	9,570	13.4	7,096	13.6
Total.....	71,503	100.0	52,376	100.0

Of the above shipments 1,936 tons were flour, 23,132 tons grain, 2,049 tons millstuffs, 8,514 tons cured meats, 2,856 tons lard, 8,425 tons dressed beef, 1,723 tons butter, 1,737 tons hides, 371 tons wool, and 11,450 tons lumber. The three Vanderbilt lines carried 36.0 per cent., while the two Pennsylvania lines carried 23.2 per cent.